# The Builder.

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## ILLUSTRATIONS.


The Hall, Blackheath, Friston, Suffolk.—Mr. E. F. Bisshopp, Architect ..... *Double-Page Ink-Photo.*
Reredos, Elvetham Church, Hants.—Mr. A. H. Skipworth, Architect ..... *Double-Page Ink-Photo.*
Manor House, Melcombe Bingham, Dorsetshire.—Sketched during Pugin Tour by Mr. Rowland W. Paul ..... *Single-Page Photo-Litho.*
Ford Abbey: The Porch.—Sketched during Pugin Tour by Mr. R. W. Paul ..... *Single-Page Photo-Litho.*
Sketches about the Golden Valley, Gloucestershire.—Drawn by Mr. Ralph Nevill, F.S.A. ..... *Two Single-Page Photo-Litho's.*

*Blocks in Text.*

Ancient Roman Piling, Bucklersbury ..... *Page* 238
Hagpath House, Gloucestershire.—Sketched by Mr. Ralph Nevill ..... 244
Diagrams of Stresses on Concrete Floors ..... 247


## CONTENTS.


Roman and Mediæval London ..... 235
One Lesson from the Recent Strike ..... 237
Notes ..... 237
Letter from Paris ..... 238
Wren as a Designer and Draughtsman ..... 239
Sanitary Congress at Worcester ..... 241
Further Notes of the Sanitary Exhibition at Worcester ..... 243
Obituary ..... 244
Reredos, Elvetham Church, Hants ..... 244
The Hall, Blackheath, Friston, Suffolk ..... 244
Bingham's, Melcombe ..... 244
Entrance Gateway, Ford Abbey ..... 244
Old Cottages, &c., about the Golden Valley, Gloucestershire ..... 244
The Architectural Association ..... 245
Paris Exhibition Awards ..... 245
The Amines Process of Sewage Treatment at Wimbledon ..... 246
Concrete Floors ..... 246
The Student's Column. Water Supply.—XIV.: Filtration ..... 248
Recent Patents ..... 249
Recent Sales of Property ..... 249
Meetings ..... 249
Plumbers' Company ..... 250
Miscellanea ..... 250
Prices Current ..... 250


### *Roman and Mediæval London.*

SOME interesting excavations are progressing at London-wall, and it is anticipated that they will contribute some addition to our knowledge of the aspects and condition of this locality in early times, inasmuch as the site has long afforded materials for the theories and speculations of London antiquaries, although up to the present time no opportunity has been afforded for accurate investigation.* The works are within the limits of the ancient city, and face the line taken by the Roman wall in its course to Moorgate and Cripplegate. The land excavated will disclose the character of the soil which at this spot represented the *Pomerium*—the space reserved when laying out a city by the Roman architects and engineers, both within and without the walls, for sanitary purposes. The buildings now in course of demolition are those situated in Leathersellers'-buildings, Little Bell-alley, Crosskey-court, and near to the Coleman-street Ward Schools, with other tortuous ways and passages, in what has hitherto been a densely-populated district, with numerous squalid and dirty though picturesque old buildings, illustrating the domestic architecture of the seventeenth and early portion of the last and present centuries. The greater part of these houses are now being removed, and a new street constructed, with substantial offices and warehouses on either side, which will form a leading thoroughfare running from London-wall in the direction of the Bank of England. The properties immediately under consideration are owned by the Leathersellers' Company, and it is a matter of satisfaction that so needed and advantageous a public improvement has been undertaken by so influential a Corporation. It is well-known that in ancient times the dealers and workers in leather were principally located at the northern edge of the city, and within the walls. The curriers established themselves in Cripplegate Ward; the tanners, tawyers, and leathersellers were grouped together near to the upper part of the river Walbrook, where they were enabled to obtain a plentiful supply of water necessary to the conduct of their business. The western, or principal estate at London-wall possessed by the Leathersellers' Company, was purchased by them in the fifteenth century. It is the land now under excavation, and was acquired for the purpose of building a hall adapted to the requirements of the craft. This is not alone a matter of tradition, but is borne out by divers entries in the "City Records." It appears that by an Act of Common Council, passed in the year 1475, it was ordered that the Masters, Wardens of the Misteries of the city, should "assemble the good men of the Misteries *in their halls*, or in other convenient places" to proceed in their liveries to the Guildhall at the election of the Mayor and Sheriffs,* and the Leathersellers' ordinances of the year 1509 require that they should meet in their own "Common Hall."

As early as the year 1477 the Company certainly possessed a hall in this locality, for it appears, from the earliest inventories and rentals, that there was "a house under the hall" from which the Company derived a rent, and that in 1531 there was a *kyttchen* as well as a *parler* occupied by the Company. Hence it may be inferred that the upper part of the buildings along the frontage of the Company's western and present estate, at London-wall, constituted *the Hall*. This must have been the place of "assembling" mentioned in the accounts of the Founders' Company, in 1516, thus; "Item, *payd at Leddyrsellars Hall, at the fyrste semblyng*, iiij*d*." Also again in 1519.† That Company had previously met at the Brewers' Hall, and at Armorers' Hall, in 1497-8; again at the latter, in 1529, and at other times, before its own hall was built in 1531.

In 1543 the Leathersellers acquired the St. Helen's estate, and occupied the buildings of the dissolved priory of Benedictine Nuns as their own hall and offices. Thenceforward all the Company's houses and land at London-wall were let to various tenants. In 1560 "the *olde Halle*" was let on lease, with a bond; and in a rental made in 1563 it is said, "of Master Peningtone, for his houses at London-wall, sometime named *the Leathersellers' Hall*, yearly rent 9*l*." In a list of leases, made about the year 1594, the first entry is as follows:—

"A lease of *th'olde Hall at London-wall* for the term of xxxj[ti] years beginning at the feast of the Annunciation of Our Lady, Anno 1588, ix[li] yearly rent, and ix[li] yearly fine, at two several payments, within fifty and six days; after upon forfeiture and a covenant for reparations within six months after warning given. And a covenant for *th'emplements* to be *prayed* at th'end of the lease as they shall be found to be worth."

Accordingly, in the Company's rental of 1596 it is thus mentioned:—"Imprimis, the house of Widow Rawlyns, called *th'olde Lethersellers Hall*, yearly rent 9*l*." "Item the same house, yearly fine 9*l*." After the expiration of that demise it was resolved, by the Court, that "The Old Hall" should be altered, and divided into "reasonable dwelling-houses," June 29, 1613; after which time its individual existence is not clearly traced. For, in a ground-plan drawn by Robert Treswell, senior, in 1614, the frontage of the Company's western estate, being 94 ft., was divided off (beginning from the east) into two shops,—a passage leading to the gardens, a kitchen, a chamber, shop, and yard, and another shop; behind all these were three gardens bounded by the "Common Sewer" of Wall-brook, which sloped off in a south-easterly direction.

Adjoining this early building, of which some few indications have been recently discovered, ran the old watercourse, and many traces have been found of the line it took in the form of numerous wooden piles which once formed its banks, and the black, moist character of the soil. Its line has been identified in many places, and as the excavations proceed, the line of the new street will in many cases follow the bed of the ancient river, which, now degenerated into a sewer and lost to sight, once formed the western boundary of the earlier Roman London. It did not in Roman days flow precisely in a line with the present thoroughfare, but took a route somewhat to the west of the modern street. It rose in the fields near Hoxton, ran through the wards of Coleman-street, Bread-street, Cheap, Walbrook, Vintry, and Dowgate, and thus to the Thames. It is probable,—and, indeed, modern excavations illustrate the notion,—that more than one brook supplied the river. The western arm commenced to the north-west of Finsbury-square, then ran in the direction of Wilson-street. The eastern branch rose near to the

* For detailed description of discoveries made in former years in the various districts mentioned, reference may be made to "Roman Antiquities, Mansion House," by John E. Price, F.S.A. "The Roman Pavement in Bucklersbury," by the same author; and to the "Transactions London and Middlesex Archæological Society." To the Council of the latter we are indebted for the use of such woodcuts as may appear in this or succeeding papers.

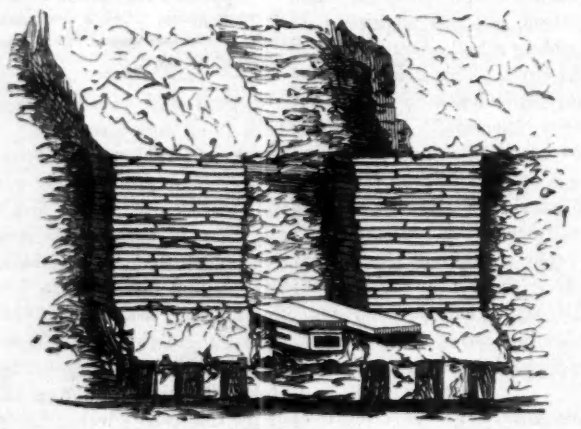
* Corporation Records, September 13, 15 Edward IV., Book V., fol. 113.

† Williams's "Worshipful Company of Founders," pp. 17, 52.

south end of the present New North-road, in the direction of Pitfield-street, Hoxton, then by Willow-walk across the Curtain-road by King John's-court to Holywell-lane, and thence east of Long-alley; then by the old burial-ground of Bethlehem Hospital along Blomfield-street to the west of the churchyard of Allhallows-on-the-Wall. Here it fell into the City ditch of the City Wall.

There were many other little brooks or rivulets which became absorbed in the City ditch; indeed the present excavations fully bear out the descriptions given by Stow and by the chronicler Howes, in the edition of his work printed in the year 1631. The field, he says, speaking of Moorfields, was until the year of King James, 1606-7, "a most noysome one and offensive place, being a general laystall, a rotten morish ground, whereof it first took its name. This field for many years was burrowed and crossed with deep stinking ditches and noysome common shewers, and was in former times held impossible to be reformed."

In certain seasons much inconvenience was felt by the water being penned or kept back, and among the civic records of the year 1415, it appears that "by reason thereof, as well many cellars and dwelling-houses were overflowed in divers streets and lanes to the said moor near and adjoining," and provision was then made for the efficient escape of the accumulation of water, "as easement to the dwelling-houses and cellars aforesaid—by reason of the immunity which they so greatly stood in need of from the overflow of the



watercourse before mentioned." It is known that Walbrook passed beneath the City Wall near to old Bethlehem Hospital to the east of the modern Moorgate-street, and a little westward of the end of Little Bell-alley in London-wall, the site of the present excavations, and which in these results have revealed what has been conjectured, viz., that it was at this point the "sluys" or "speye" must have been placed, for the river ran, as shown by the lines of wooden piles now discovered, very nearly in the line of the alley, possibly at its northern end, and continuing along its western side. It was at this point, adjoining the Swan's Nest Tavern, a quaint old building which yet stands, that, in the year 1835, an interesting discovery of Roman remains was made. A pit or well was disclosed which had been carefully planked with boards, and which was found to contain a store of earthenware vessels of divers patterns and capacities, together with a coin of Allectus. Some interesting indications of a red brick arch for the transit of water have been observed, but are now entirely gone. This structure was in Bell-alley, and will, doubtless, be observed in other places. In height it measured nearly 6 ft., and 4 ft in width. It was supported on either side by massive piles of elm, between which the river ran. These were firmly driven into the natural soil, and were 6 ft. long, the total depth of the structure being nearly 18 ft. from the level of the street. Some of the stakes have been preserved as relics, and, with the exception of a little external wear, the timber is as sound as when first utilised for the purpose. The black soil which marks the river bed abounds in bones of animals, among them relics of the ox, *Bos Longifrons*, the horse, sheep, goats, dogs, &c., together with a skull of an ancient pig or boar, with both tusks complete and in sound preservation. The locality probably marked the site of the slaughter-houses and shambles of Old London, for some curious specimens of butchers' knives of the Roman age have been exhumed, among them one well known as a *culter*, larger than is usually found in City diggings, and with a wooden handle in fair condition. These for the present are preserved at the Company's Hall in St. Helen's-place.

The practice of constructing such massive masonry upon wooden piles is well known and is of great antiquity. With the Romans great care was invariably exercised. As a rule, their builders excavated until they arrived, as in the present case, on solid ground, and as deep as necessary. Vitruvius records how, if the land was soft or marshy, they strengthened the work by introducing piles of alder, olive, oak, or other timber, a little singed by fire, frequently filling the intervening spaces with charcoal. The same practice continued with Saxons and Normans alike, the foundations of many of their structures in this country having been prepared in like manner,—for example, the old London Bridge erected in the year 1176; the foundations of the stone bridge over the River Grant; and, to refer to a still earlier period, the Church of Croyland Abbey, in Lincolnshire, erected as early as the year 716.

The accompanying woodcut preserves a good illustration of the Roman practice. It represents what was discovered in the year 1869, at the finding of the mosaic pavement in Bucklersbury. These two walls of tilework had to be removed, and it was noticed that they were supported by wooden piling. Blocks of chalk had been placed upon the timber-work, and upon these the tiles were laid. It affords an excellent illustration of the custom; and the close joints, with so little mortar intervening, are proofs of a very early method of construction. Similar work was noticed a few years since, when a vast number of Roman walls and foundations were removed for the necessities of the new City Market at Leadenhall. One large pile of this early work was considered to be of such interest that arrangements were made by the Corporation for its preservation on the site.

Opposite to the main thoroughfare of London-wall is a narrow court or alley, known as Cross-key-court, and adjoining the Ward schools; here, at a depth of about twenty feet the maiden soil is reached, and a good gravelly foundation is at hand for the requirements of the new buildings. It was in removing the buildings at this spot that two interesting pieces of worked stone were exhumed. They had in past days been utilised as building materials. The one is the upper portion of a carved mantelpiece of Tudor design, and may represent an Elizabethan or Jacobean relic. On the spandrils are carved ornaments, and a shield in the centre, upon which has been carved some heraldic device, now decayed; it shows evidence of having been decorated both in gold and colours. The other, a marble fragment, fluted on each side, and measuring 18 in. long, by 4½ in. in width. Upon one of its squared edges are the letters —"RISE AGAYN AND LIVE." Whether it is to be associated with a sepulchral monument or a portion of a running inscription connected with the ancient hall, is at present difficult to determine.

There have been found, in addition, various knives of divers form, but belonging to the Roman Age; Durobrivian and Upchurch ware, of the latter two perfect urns, decorated with the familiar dotted ornament, and coated with metallic glaze; figured Samian ware, and fragments bearing potters' names; specimens of Roman glass, together with Norman and Mediæval pottery.

There are other associations of interest in connexion with this immediate neighbourhood of later date. In Coleman-street the five members accused of treason by Charles I. contrived to conceal themselves; and at a tavern, known as the "Star," Oliver Cromwell and his comrades were wont to meet. In Swan-alley, upon the east side of the thoroughfare, one Venner, a wine cooper and Millenarian, preached and advocated the opinions of his followers "to the soldiers of King Jesus." An insurrection ensued, resulting in Venner being hanged and quartered in Coleman-street, Jan. 19, 1660-1. It was John Goodwin, Minister of Coleman-street, who waited on Charles I. the day before his execution and tendered his religious ministrations. The King expressed his thanks, but remarked that he had selected Dr. Juxon, whom he knew. Bloomfield, the well-known author of the "Farmer's Boy," followed his calling of a shoemaker at 14, Great Bell-yard,—the poet's card described him, "Bloomfield, ladies' shoe maker, 14, Great Bell-yard, Coleman-street, the best real Spanish leather at reasonable prices." Adjoining the "Swan's Nest" tavern is a charming oasis, in what at present is a city desert. In a small, well-paved, and carefully-kept square, are six almshouses, founded in the year 1617 by Christopher Evre, who gave 240*l.* for their building and 400*l.* for the purchase of the land. They were erected for the maintenance of six poor couples. There is also a house containing six rooms, to be occupied by six unmarried women. Formerly there was a small square, known as Printing House-square, which abutted upon the building; this was removed, and its boundary wall pulled down for the erection of Moorgate-street-buildings. During the recent summer months these houses have had a charming and attractive appearance, for their occupants have vied with each other in promoting window gardens, and the festoons of creepers, geraniums, and other floral decorations have presented a scene probably but little known to the citizens save to casual passers-by.

As much more remains to be done, further results may be anticipated. The works are daily visited by Mr. John E. Price, F.S.A., and notes and memoranda taken. It is satisfactory to know that every facility is given by the Company for investigation, considerable interest having been taken in the matter by its members through the present Master, C. D. E. Ardley, Esq., who is desirous that all information that it is possible to gather should be obtained. The objects, as found, are for the present conveyed from time to time to the Hall in St. Helen's-place, Bishopsgate.

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**Resignation of the City Surveyor of York.**—At a special meeting of the York City Council, held in the Council Chamber on Tuesday last, the Lord Mayor (Alderman J. Agar) who presided, read a letter from Mr. E. B. Mawbey, the City Surveyor, stating that the Corporation of Leicester, having unanimously elected him Borough Engineer and Surveyor, he desired respectfully to tender his resignation. The resignation was accepted, and the Council, by resolution, recorded their high appreciation of the ability, energy, and courtesy which had characterised Mr. Mawbey's tenure of office as City Surveyor. It was resolved to advertise for a successor, at a salary of 400*l.* per annum.

## ONE LESSON FROM THE RECENT STRIKE.

IT is to be hoped that the recent dock labourers' strike will not pass into oblivion with the same rapidity as most events of the present day. Though primarily a strike of dock labourers, its occurrence is a matter for the serious consideration of all engaged in building or contracting business, and it would be unwise for practical and thoughtful men to let the event pass without thought for the future. We will shortly state a few considerations which should not be forgotten.

In the first place, the late strike was one of unskilled labour. It therefore differed vitally from most of the northern strikes, which have been strikes of skilled labour. It has shown the power of masses of men whom, as workmen, the ordinary skilled artisan would regard with contempt, to disorganise the whole trade of the metropolis; it may even be said of the kingdom, and of many parts of the civilised world. Among those who have to carry on business for their livelihood, builders and contractors are peculiarly dependent on unskilled labour. The plasterer and the bricklayer each have their labourer. In fact, as there was a knight and a squire in the Middle Ages, so now there is the skilled workman and the labourer. The labourers all over the kingdom have by this strike been enabled to obtain an idea, if not of their power, at any rate of their capacity to cause inconvenience, and it is hardly likely, in these days of wide knowledge of events, and of energetic Socialist leaders, that the success of the dock strike should not cause labour movements more or less formidable and more or less inconvenient to arise from time to time throughout the kingdom. The fact that at the head of the late movement were pronounced Socialists is a pretty certain augury that similar movements will be attempted whenever and wherever practicable in carrying on the war of labour against capital. It behoves all practical business men, therefore, carefully to review their position; to consider their relations with their workmen, and the form and substance of their contracts with third parties. For example, if there are employers who are aware that their labourers are underpaid, it is most shortsighted not, so far as possible, to remedy such a state of things. It is equally foolish not, so far as possible, to safeguard themselves against strikes by having in their employ permanent workmen, whose interest is thus bound up with their own. Again, the late strike ought certainly to give an impetus to all labour-saving apparatus. There are many farmers,—to take an instance from a different business,—who employ a reaping and binding machine,—*i.e.*, a machine which cuts the corn, binds it, and lays it in sheafs on the ground,—not because they prefer it for its own sake, but because it renders them independent of manual labour. It is the province of science, and it should be the object of men of business, to make machinery take the place of unskilled labour. These are, shortly stated, some of the general considerations which should for a long time to come occupy the thoughts of every man who is a builder or a contractor,—or, indeed, is engaged in constructive work which requires much manual labour.

A more particular matter for consideration is one which relates to the Dock Companies of London. By a strike between the Dock Companies and their labourers, shipowners, consignors, and consignees of cargo, and consumers, have been inconvenienced and probably, in some instances, ruined. Builders and contractors have a vital interest, therefore, in safeguarding themselves against a similar event in the future. Placed at the East-end of London, amidst the most Socialistic elements of the metropolis, the workmen at the Docks are quite likely to be again aroused into a strike. It behoves members of the building trade, therefore, to assist shipowners, so far as possible, in rendering themselves less dependent on the Dock Companies, so that goods and raw material from abroad may be less likely to be again delayed in transit. The particular subject of contention in the strike itself was outside of our special province, and we forbore to meddle with it. We only wish to point out the lesson it has left for other large employers of unskilled labour, many of whom are connected with building trades and building operations.

## NOTES.

WE congratulate the London County Council on their decisive and sensible action, recorded in our brief note of their proceedings in another column, in regard to the Strand improvement in the neighbourhood of St. Mary's. In spite of some opposition from timid members, the Council has taken the right and the spirited course of resolving at once to apply for powers to pull down the houses on the south side of Holywell-street, by way of opening up the road-way to the north of the two churches. This is the course which we have repeatedly advocated as the only rational one to pursue. We may now, we believe, consider St. Mary's safe, for the dullest person will see, when the houses are once down, how fine a treatment of the site, both practically and architecturally, can be secured by taking the Strand road-way round on each side of the two churches. The determination of the Council is a gratifying indication that it is, at all events, a more enlightened body in regard to architectural matters than the Metropolitan Board of Works.

IT appears that at the eleventh hour a memorial is being got up in the diocese of St. Albans to protest against the havoc Lord Grimthorpe has been allowed to make with the Abbey. The memorialists say that he has utterly destroyed the north and south transepts instead of restoring and repairing them, and that they consider the fate that has befallen the church to be "a national misfortune and disgrace." "National misfortune" is perhaps rather too solemn an expression, but the other words are warranted, for it is no less than a "national disgrace" that the general public and the press in this country should be so ignorant and indifferent about architecture as to think that any blunderer should have the right to pull about and deface a great architectural monument for his own amusement, because he can afford to pay for it. As we have before said, we believe such a thing would be impossible in any other country in Europe. But why did not the memorialists say all this long ago? The mischief is nearly all done now.

IN *L'Architecture* for September 28, M. Fevrier makes a protest against the injustice to French architects arising from the responsibility put upon them by the law in regard to practical failures in their buildings: injustice which he maintains would be far greater even than it is if the law were actually applied in its rigour. This is a subject on which French architects are frequently protesting, though they always end by declining to recommend the abolition of the law which visits them with the pecuniary responsibility for any failure in their buildings. They have generally come to the conclusion that the effect of the law is practically to render the profession in France more respected than they would be without it: and we are inclined to think they are right. M. Fevrier, though he writes rather bitterly on the subject, does not propose the abolition of the law, but he enlarges on the peculiar hardship with which it presses or may press on the provincial architect in a country practice, who is obliged to oversee buildings at a distance from one another, as well as look after his office and receive his clients, and is at the mercy of a contractor who can only be looked after personally at long intervals. M. Fevrier's proposition to ameliorate the case amounts merely to the compulsory appointment of what we should call a clerk of works, one of whose special duties should be to enter in a book whatever order the architect has given to the contractor, with the date, &c.; and that, on this written proof that such an order was given, the *onus* for bad work should fall on the contractor and not on the architect. This seems a perfectly reasonable suggestion, which would relieve the architect from anxiety without taking proper responsibility off his shoulders, and would probably, as M. Fevrier says, have a very beneficial effect on the way in which the contractor's work is carried out.

WE have received from the American Society of Civil Engineers the report of the Special Committee on the New Notation of Time, with the opinions of railway managers and others in favour of the 24-hour system. From the report we learn that the 24-hour system of reckoning has been thoroughly tested for two or three years on 3,657 miles of railway in the United States, "that no difficulty whatever has been experienced in introducing the change, that it has been readily accepted by the public without a single objection being heard, that its extreme simplicity and the impossibility of errors resulting from its use facilitates the movements of trains and promotes the public safety. The new system having thus proved so satisfactory in every way, it has now been determined to employ it on 3,053 additional contiguous miles, which will make a total length of 6,710 miles of railway shortly to be operated under the new notation." We readily accept the testimony here given to the increased convenience of the 24-hour system of reckoning, the universal introduction of which we believe to be only a question of time, and of a comparatively short time.

WE are glad to see that the Metropolitan Public Gardens Association, which has done good work in preserving and acquiring open spaces for London, is desirous to co-operate with all who are interested in "saving Holland Park from the hands of the builder," and preserving it as a public open space. Their proposition is that an offer for the Park for some definite period should be obtained, in order to give time for raising the requisite amount by public subscription. Our own generation has already seen a considerable curtailment, for building purposes, of the demesne attaching to what represents the Manor-house of Kensington. Yet the fields remain, to the south, wherein Lady Sarah Lennox,—"the lass o' Richmond-hill,"—used to coquet at hay-making as the young King George III. rode along the road to Windsor. That lady, afterwards mother to the three Napiers,—Charles, George, and William,—was daughter to Charles, second Duke of Richmond. Her eldest sister, Georgiana, married Henry, son to Sir Stephen Fox, who in 1763 was created Baron Holland of Foxley, county Wilts. In or about 1762 Lord Holland had bought this property,—at one time held by the De Veres, Earls of Oxford,—of William Edwardes (created Baron Kensington in 1776), who had succeeded to the estates of the Rich family, upon the demise, *s.p.* in 1721, of his kinsman Edward, seventh Earl of Warwick of that house. In 1607 John Thorpe built the central portion and the turrets of Holland House (his drawings may be seen in the Soane Museum) for Sir Walter Cope. Cope's daughter and co-heir, Isabella, brought the estate after marriage to Henry Rich, afterwards Lord Kensington and Earl of Holland, the Royalist who, together with Arthur, Lord Capell, and James, Duke of Hamilton, was beheaded in front of Westminster Hall on March 9, 1649. This Lord Holland added the wings and arcade on to Thorpe's building. The eastern stone gateway, with its steps, designed by Inigo Jones, was fashioned by Nicholas Stone; the lodges and gates on the Kensington high-road were added fifty years ago. Of the various residents whose names are less commonly remembered in connexion with this house, may be mentioned the Lord-General Fairfax, and his wife,—the "starry Vere" of Marvell's lines; Sir John Chardin, the

traveller; Katharine Darnley, Duchess of Buckingham-hire, a daughter of James II.; Bishop Atterbury, William Penn, and the honest Jacobite, the "downright Shippen" of Pope.

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A CORRESPONDENT writes to us that he has "recently visited four new country houses in a picturesque district within fifty miles of London, and in each case the stables have been placed close up to the house." Even if a building owner desires to have stables close to the house, the architect should do his best to have this plan changed. It is the greatest possible mistake, when there is a reasonable space on which to build, to put the stables very close to the house. In the first place, the space near the house is much better utilised as a part of the garden; in the next, the stables, being usually of inferior design to the house, take away from its effect. Again, however well managed stables may be, there are often smells from them, noise of horses stamping, and washing of carriages. When very close to the house, idleness in both indoor and outdoor servants is encouraged; the coachman runs in to have a word with the cook, and the housemaid to have one with the groom. In fact, stables ought to be several hundred yards from a house.

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THE Australian *Builders' and Contractors' News*, referring to an extensive fire that took place at Melbourne on Aug. 10, remarks on some of the special difficulties experienced in this case in contending with fires "in the very lofty buildings with which it has become the fashion to disfigure Melbourne." The fire-escapes, it is observed, were of no use at all, as they got entangled in the network of overhead telegraph wires. This suggests a new danger in connexion with overhead telegraph wires, especially in cities where there is, as there certainly is in London as well as in Melbourne, a growing ambition to build Towers of Babel in the shape of residential chambers.

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THE report made by Dr. Gresswell to the Local Government Board on the general sanitary condition of the Buckingham Rural Sanitary District gives a melancholy account of dilapidated, damp, and unventilated houses, and drinking-water drawn from ground polluted with perennial filth. In regard to water supply we may quote the following:—

"At Steeple Claydon there is a public pump-well at the top of the village; a sewage swamp lies some eight yards to one side of it. Ten or twelve cottagers get their water from a pump-well in a garden; a sink catch-pit is close by the well and vault privies and slop-holes are round about it.

At Thornborough the water for about thirty cottages is taken from one or other of two dip-wells on the village common; one of these wells is about twenty yards below the burial-ground, and about ten yards below the school privy, which has evidently been overflowing on all sides. Six cottagers take their water from a roadside dip trough, the supply to which quickly fails in dry seasons; two others depend upon a well, about which lies a large sewage swamp; three others upon a well close by an outdoor sink, an open drain and cesspool: and so on.

Tingewick is supplied in the main from dip-wells, sunk in soil which must be permeated with filth from slop-holes, privy vaults, and cesspools.

At Twyford, where there are about sixty cottages, water has to be fetched from the church well at the very lower end of the village; this well is sunk 10 ft. deep in loose drift about eleven yards from and below the cemetery; some of the villagers have to go close upon a mile for this water."

Imagine the chances for common cleanliness under those circumstances! But what follows about the schools is worse:—

"The sanitary circumstances of the schools deserve special mention. At Thornborough the school, which has an average attendance of eighty-six children of both sexes, is supplied with but a single privy (!), and the receptacle (a vault) has evidently been overflowing on all sides. At Twyford the privy for the school-girls is so placed that emanations from it must needs enter the school-room. The privy receptacles at this school discharge into a closed cesspit, the overflow from which is carried off by piping into a ditch. The gases formed in the cesspit, *which has not been cleaned out for four years*, can escape only by way of the privies. At the Padbury school the privy receptacles are vaults; the urinal discharges, it seems, directly into the roadway; and the pump, from which the children obtain water while at school, is not ten yards from the privy vault."

A pleasant outlook for the physical well-being and moral decency of the rising generation.

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THE *Art Journal* for October contains the second part of a suggestive and thoughtful article by Mr. Aldam Heaton on "Beauty in Colour and Form; and where to seek them," in the course of which Mr. Heaton gives one of the best brief definitions or illustrations we have met with of the process by which the painting of natural objects pictorially is reduced down to their decorative treatment, by elimination and simplification. Mr. Heaton takes the treatment of a rose in art as an example, and shows what is necessary to suit the original flower for appearing as wall decoration or painting on china,—and *why* it is necessary. One remark in the article, as to form, may however mislead some readers: the writer says that "Nature is always making severe and delicate curves, and we are always making exaggerated and wobbly ones," and that a drawing of a holly leaf, without direct reference to the original, is almost sure to be exaggerated in the curves. This is quite true, and the delicacy of curves in Nature cannot be better appreciated than by practice in drawing carefully from flowers and foliage. But in such matters as the ramification of plants, on the other hand, Nature is always making angles and elbows which we are obliged, in decorative treatment, to change into curves for our purpose; a necessity which has been felt even by many who cannot analyse the reason for it.

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IN consequence of the death of the late Lord Ashburton, it is announced that Bath House, at the south-western corner of Bolton-street, Piccadilly, will be offered for sale by auction on December 5th next. This mansion, conspicuous for its sumptuous fittings, and a central hall which rises to the entire height of the building, was erected on the site of a former Bath House,—belonging to William Pulteney, Earl of Bath,—by Alexander Baring, President of the Board of Trade and Master of the Mint, who was elevated Baron Ashburton, of Ashburton, county Devon, on April 10, 1835. Here Lord Ashburton formed a well-known gallery of works of art, comprising several examples of the Flemish, Dutch, and Italian schools, together with paintings by Velasquez and Murillo; the Dutch and Flemish pictures being from the Talleyrand collection. This house is famous for the parties which used to be attended by Tom Moore, Rogers, Croker, Chantrey, Wilkie, Sydney Smith, and other celebrities. The property is held for a term of thirty years unexpired, at a ground-rent of 50*l.* per annum.

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IN the *Portfolio* for this month Mr. Hamerton publishes a short article on "A Tendency in Contemporary Painting" which is worth the attention of artists. The "tendency" is the too obvious one at present to be content with the most commonplace and vulgar subjects. "There are French landscape-painters," he observes, "who will take any bit of ugly field, any turn of a common highway, and paint them as seriously as if the object presented some kind of interest, when in fact the only interest is that of manual skill. . . . . In figure-painting the same tendency shows itself very strongly by the increasing habit of representing the most commonplace personages in the most ordinary attitudes and occupations, with vulgar though appropriate surroundings." If it be answered that the great Dutch painters did the same and got fame for their works, Mr. Hamerton replies that though they chose vulgar subjects they did not make them into vulgar pictures. They gave refined thought and perception to composition and light and shade, and the execution of detail; matters which too many of the modern school referred to regard as beneath them. The painters of this school will be very much scandalised at finding their work classified by Mr. Hamerton as "good manual work" (is it always that?) with no intellectual quality in it. For some reason, we observe that the painters of these pictures with no subject seem to regard themselves as on a higher intellectual level than their compeers. Mr. Hamerton's note of interrogation on the subject is much to the point at present.

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## LETTER FROM PARIS.

As announced in our last letter, Dalou's monument to the Republic was solemnly inaugurated on the Place de la Nation on Saturday, the 21st of September, the anniversary of the first proclamation of the Republic. It was however only a plaster model, bronzed, that carried off the honours of the day, for the actual permanent work, which the founder Bingen is now reproducing by the *cire perdue* process, will not be ready for six months. The model, the size of the original, has been executed within a few weeks with extraordinary rapidity, and gives an absolutely realistic representation of the actual work. The design, of which the *Builder* gave an illustration some years ago, has undergone little modification. The figure of the Republic has been a little disengaged from its draperies, so as to define the figure more; otherwise the design remains as before illustrated.

The group, of which the figures are about four mètres in height, is placed on a pedestal in three stages, from which the water flows in cascades into a basin surrounded by lawns flower-beds and plantations. Subsequently, when the real work has been substituted for the temporary model, the basin will be altered by elongating its axis, and the Muncipal Administration intends to commission from M. Dalou figures of Nereids and Tritons which will combine their *jets d'eau* with the cascades of the central monument.

The inauguration ceremony was the occasion of a triumph for the distinguished artist, on whom the President, amidst the applause of the spectators, conferred the Cross of the Legion of Honour.

The monument to Eugène Delacroix, also the work of M. Dalou, is to be shortly erected in the Luxembourg Garden, near the new museum. The marble pedestal is already in position, and only awaits the sculptural portion, and the work in connexion with the fountain is nearly completed.

The distribution of awards in connexion with the Exhibition took place on Sept. 29 at the Palais d'Industrie.* Without going into a detailed description of the ceremonial, one may well spare a word of special commendation for the fine decorations painted there by MM. Lavastre and Carpezat for a recent fête, the only fault of which was that the architectural details in connexion with them seemed a little too heavy for a building of which the main construction is iron.

We have now arrived at the last month of the existence of the Great Exhibition. While the attendance still numbers about 200,000 daily the question of closing is being discussed, and various reports are circulated in reference to it. The general impression, however, is that Oct. 31 will be adhered to, unless exceptionally fine weather and a continued large attendance should possibly prolong the days of the Exhibition for a fortnight.

The "Comité de la Presse" met last week to award the prize offered by M. Osiris for the most *useful* work in connexion with the Exhibition. Rendering all appreciation to the Palaces "des Beaux Arts" and "des Arts Liberaux" of M. Formigé, and the central dome of M. Bouvard, it was finally decided to award the prize for the Galerie des Machines. Accordingly M. Dutert, who made the general design, will receive 20,000 fr.; M. Contamin, the engineer-in-chief for the ironwork, 15,000; MM. Charton and Pierron, the engineers, as well as the architects Deglane, Blavette, and Hénard, 3,000 each. The other 50,000 fr. will be divided among the workmen who took part in the construction.

In a few days will take place the inauguration of the new Bourse. The works, commenced in 1888, have been carried on with great rapidity by the architect, M. Blondel, who, by the terms of his engagement with

* A selection from the list of awards will be found in another column.

the Municipal Administration, will remain for seventy-five years "propriétaire" of the works, which will then revert to the city of Paris.

This building, which replaces the old Halle aux Blés, itself built on the site of the ancient Hotel of Catherine de Medicis, is in the style of Louis XVI., built in white stone and occupying an area of 2,500 square mètres. In the interior is an immense circular hall of 1,200 mètres in area, the walls pierced with doors and windows separated by an order of columns. This hall is covered by an iron domed roof constructed by Creusot, and decorated with paintings "marouflées" on zinc, and which represent Commerce and the principal products of the old and new world. The arrangement of these decorations had been already indicated by the groups in *grisaille* on the entablature, the last work of the lamented artist, Mazerolles. Between each of these groups are the following compositions: "Le Nord," a heavy and laboured piece of work by M. D. Laugée; "Europe," by M. Lucas, a fine piece of colour; "l'Orient," by M. Clairin, which exhibits the "loud" colouring and glitter always characteristic of that artist's work; and "America" by M. Luminais, a cold and characterless composition, very inferior to some other works by the same painter. Externally the pediment of the main entrance is decorated with a group in stone executed by M. Croisy, and representing the City of Paris, surrounded by figures representing Commerce, Industry, Arts, and Agriculture. The attic of the façade is to be decorated with a series of figures which have been entrusted to various well-known artists.

The building of the Bourse de Commerce has had the effect, as a concomitant result, of changing completely the aspect of one of the oldest quarters of Paris. M. Blondel has completed the scheme by building a series of fine blocks of offices, the façades of which form an effective group in relation to the principal entrance of the Hall.

We may mention the recent inauguration, in the Cour d'Honneur of the Alfort Veterinary School, of a memorial statue to Henri Bouley, a former president of the Académie des Sciences, who was for many years the director of the Alfort establishment. The statue, in white marble on a pedestal of grey Jura granite, is the work of M. Allouard, the plan of the monument having been designed by the architect M. Montzauze.

During the holiday time of the year artistic doings and news are scarce, or one would hardly mention the exhibition (the fifth) of the "Artistes Indépendants," three hundred pictures and a dozen statues; more interesting to their authors, probably, than to any one else.

A new series of mural paintings has been uncovered at the Panthéon, on the wall in the north transept facing that on which Cabanel has illustrated the life of St. Louis. The Government had originally entrusted this work to Baudry, who was to illustrate some episodes in the life of Joan of Arc. On the death of Baudry, M. Lenepveu was chosen to replace him. He has executed four large compositions representing the initiation at Domremy, the fight at Orleans, the glorification at Reims, and the martyrdom of Jeanne at Rouen.

Speaking of the Panthéon leads us to mention that M. Larroumet, the Directeur des Beaux Arts, has addressed a report to the Minister of Public Instruction in regard to the sculptural decoration of the building, the suggestions in which have been approved by the Government. According to the terms of the report, the projected decoration will include placing on the longitudinal axis of the nave a monument to the Republic, which will have for its principal *motif* the figure of France surrounded by figures of Liberty, Equality, and Fraternity. This will be supplemented by four reliefs on the piers which carry the dome. These bas-reliefs will consist each of three or four figures surrounded by architectural canopies, recording or suggesting the epoch to which the principal monument refers. All the architectural portion of the work will be executed under the direction of M. Deschault, Government architect.

The Mediæval group, of which the architectural *encadrement* will be Gothic, will represent Religious Faith and its influence on various manifestations of human thought and action (in Art, Poetry, and Military heroism). The Renaissance group will represent the Art and Literature of the sixteenth century, but indicating Art in its three forms, and more especially in architecture and sculpture, as the most remarkable manifestation of that epoch in France. The group of the seventeenth century will represent Literature (Moral Philosophy, Dramatic Poetry, Oratory), which was the chief glory of France in that century. The group of the eighteenth century will represent Philosophy, or the French school of thought of that century, which was the precursor of the new social movement. This *ensemble* will be completed by the statues of Descartes, Voltaire, Rousseau, Mirabeau, Carnot, Hoche, Kléber, and Victor Hugo.

Of course such a scheme as this, which comprises about eighty figures altogether, will demand considerable time for its realisation; but the Ministry has decided on the immediate execution of the monuments to Mirabeau and Victor Hugo, which will each cost 75,000 fr. M. Injalbert is commissioned to execute the statue of Mirabeau, to represent him as speaking from the Tribune. M. Rodin, who is to execute the statue of Hugo, will represent the poet seated on a rock, supposed to be on the Guernsey coast, and attended by the Muses of "Jeunesse," "Age Mûr," and "Vieillesse." We shall probably have occasion more than once to revert to the subject of this great decorative scheme, which will entirely change the character of the interior of the Panthéon.

The neighbourhood of the Luxembourg and the Rue Soufflot will in a short time undergo considerable alterations. It is at this point, at the corner of the Rue Medicis and the Boulevard St. Michel, that the Orleans Railway Company are to place their station for the railway from Paris to Sceaux and Limours, which is now situated in the Place Denfert-Rocherau. The work necessary to carry out the scheme will occupy about two years. The railway will be an underground one with the station between the Luxembourg and the existing terminus. This change will place the neighbourhood of the Rive Gauche in direct communication with the picturesque valley of the Chevreuse, now neglected owing to the difficulty of access, but which will probably be a popular holiday resort when rendered more accesible.

The Louvre is to be enriched with two of the best pictures of Millet, the "Glaneuses" and the "Meules de Paille." The first of these, which was in the *Salon* of 1857, was bought by Madame Pomery, of Reims, in order to present it to the National collection. The second, which is in the retrospective exhibition on the Champ de Mars, has been offered by Madame Sanson-Davilliers, who lately presented also to the Louvre the "Printemps" of the same artist.

The noble example set by these generous ladies appears to be contagious, for it is now said that Madame Maurice Cottier, widow of a rich amateur well known in the Parisian world, has left or intends to leave to the Louvre her collection of modern pictures, and that Madame Rœderer intends to present to the State a pastel by Millet of the "Angelus," a replica of the celebrated painting, which is considered by some to be, if anything, superior to the original.

Now that the cupola of the Pavillon Daru at the Louvre is completely finished, there should be no delay in the completion of the staircase which it covers. M. Guillaume, the architect, has prepared the necessary designs, and it is understood that the Minister of Fine Arts will now ask for the necessary vote for the work. The staircase in question, which has remained unfinished since the construction of this portion of the Louvre, consists of 125 steps separated by eleven landings. In its actual state, with its bare stone walls of little better than rough masonry, it contrasts pitiably with the fine mosaics of the cupola. The cost of the work, including marble facing to the walls, would be about a million francs. It is a large sum, no doubt, and possibly Parliament may hesitate to vote it this winter.

At the École des Beaux-Arts, where the "Grande Médaille d'Émulation" has been awarded this year to M. Breffendille, pupil of M. Guadet, a certain number of competitions have also been adjudicated on, of which the most important was that in landscape for the Troyon prize. The subject given was "Spring." Thirty-nine competitors submitted pictures, and the prize was adjudged to M. Albert G. Rigolot, pupil of M. Pelouze. The jury have also given their awards in the Abel Blouet competition (Architecture) and the Jay competition (Construction). In the first the prize was awarded to M. Eustache, pupil of M. Ginain; in the second, to M. Du Bois d'Auberville, pupil of M. Pascal.

Two recent inaugurations may be noted: that of the monument executed by M. Rodin to the memory of Bastien-Lepage, and that of the new Lycée Buffon. The Bastien-Lepage monument, unveiled on September 29, stands in the painter's native town, Damvillers. The Lycée Buffon, of which M. Vaudremer was the architect, is a very large Secondary Education establishment, of a very plain and austere style of architecture. It will accommodate 450 "externs" and 350 day boarders. The works were commenced in May 1885, and the building altogether has cost 6,400,000 francs.

We have to mention the death of two artists, M. Albert Claris, an architect, and M. Camille Saglio, a painter. M. Claris was a pupil of Questel, and obtained a troisième médaille in the *Salon* of 1879. M. Saglio, who was born at Strasburg, studied in the atelier of Jollvard and in that of Camille Roqueplan, and obtained a deuxième médaille in the *Salon* of 1846. He was a landscape painter of talent who for a long time exhibited, in every annual *Salon*, paintings of scenes in Normandy and Italy. He had latterly fallen rather into oblivion, though he had his days of celebrity.

## WREN AS A DESIGNER AND DRAUGHTSMAN.

The following is the latter portion of Professor Roger Smith's opening lecture on Thursday last to the architectural students at University College, the subject of which was "Sir Christopher Wren and his Architecture." The earlier portion of the lecture was a *resumé* of the well-known facts as to Wren and his work.

"Turning in the first instance, as an architect instinctively does, to the plans, one is struck at the outset by the immense variety which they exhibit, and the great skill shown in producing effect by the simplest means; and a further examination reveals the wonderful picturesqueness attained in a style to which most architects would say the picturesque is foreign, while the formal and the symmetrical are its natural expression. It must not be forgotten that these churches not only occupy old sites, but stand with their walls, and even their columns in some cases, on old foundations, so that the ruins which had to be dealt with limited the architect to a great extent. To an ordinary designer these limits would have been fetters; to the man of genius they were suggestions, and though we can never have the means of knowing precisely how much of all this clever planning is entirely original, and how much grew partly out of the condition of each building-site, there is none the less credit due to Wren for this remarkable series of church plans, and his perfect and entirely novel adaptation of the style in which he worked to those plans. In not a few instances the site was nearly square, but as often as not it failed to be truly rectangular, and we have to admire many clever devices for masking the irregularity, and others for making an interesting interior out of a mere square room. In not a few instances there is an aisle at one side only; in some there is no aisle, but columns, of which the entablatures are so disposed as to break up the interior in some way. Of the churches of moderate size, that of St. Stephen, Walbrook, is the most beautiful and the most famous. Here the whole effect of the interior is due to the skilful employment of columns and to the domical ceiling which they carry, so that within the limits of four plain walls the architect has known how to produce the effect of a nave, choir, and transept, with a dome over the intersection. The ground-plan of St. Stephen's is that of a rectangular room, measuring 82·7 by 60·0, with a projection, consisting of the tower and porch, at the west end. This is transformed into what I have described by means of the introduction of sixteen Corinthian columns on pedestals, and carrying a compressed entablature, above which rise arches. Eight of these columns are so placed as to carry the pendentives under a flattish dome of about 43·0 diameter, lighted by a lantern; and the columns are so disposed that by the simple device of returning the entablature back against the side and end walls, all the effect of nave, choir, and transepts is produced. The lighting is well disposed, all the windows being high up, and as usual the fine oak panelled dado forms a dark and vigorous base for the architectural features to rest upon. I have searched on Mr. Clayton's

drawings for some of those geometrical relations between the main dimensions which are generally to be found in Wren's designs, and I believe always exist there—discovered or not; and I have found that the radius of the opening of the dome appears to have been used as a dominant dimension. This radius is exactly one-third of the width of the interior; the height of the dome from the cornice upward exactly equals that radius, and the height from the floor to that cornice is very slightly more than twice the same dimension; so that the diameter of the opening through which the dome is seen is two-thirds the width of the building, and is (within about 6 in.) equal to its own height from the floor; and as there may be some slight inaccuracies, I fully believe this was intended to be exactly so. There can be little doubt that in such geometrical relations of one part to another as these lies no small part of the subtle charm of Wren's best interiors. Attached to this church is an extremely plain tower, surmounted by a comparatively small but very graceful stone terminal, which forms a very good example of Wren's treatment, both of the design and construction of such spires. The tower finishes with a balustrade. Within this, on a stilted pedestal, rises a smaller square structure, with three engaged shafts at each angle, and pilasters within them again. These carry an entablature, and above that comes a second story, consisting of a kind of attic, surmounted by a gradually-diminishing finial. The whole outline above the top of the first order is carefully kept within a pair of raking lines which (having seen how Wren uses them in his design at Oxford for a somewhat similar but richer spire) there is no difficulty in applying. The construction appears to depend upon a device which is met with frequently,—a truncated dome springing from the walls of the tower, and carrying the weight of the inner part of the spire. Of churches of the largest type the two best are St. Andrew's, Holborn, and St. James's, Piccadilly. In each of these we have an arrangement very nearly like that of a Roman basilica, the church having a regular nave and aisles, and deep galleries filling the upper part of the aisles and the western end of the church. The exterior of these churches of Sir Christopher Wren did not, as a rule, receive much elaboration. Contrary to a good deal of modern church-building practice, Wren seems to have considered a church as an *interior* first. He adapted it as well as he could to the purposes of those who were to make use of it. He lavished upon the interior the best resources of his art, and, as a rule, probably devoted the chief part of such outlay as he could dispose of for purposes of architectural effect to making that part sightly and seemly, and he appears to have cared but little for the effect which the exterior was to produce. To this, however, there is in its practice one notable exception,—his treatment of the steeple. Probably most of the Mediæval churches of London which perished in the Fire had each a tower,—and in many cases a spire or lantern; however this may have been, it is an all but universal rule with Wren to provide a tower, and, in many cases, to crown it with an ornamental structure, and on this part of the exterior of a church he customarily bestowed the greatest pains,—indeed, it is in the designs of his towers and spires that Wren's originality is most shown. It was a remark of that acute critic, Professor Cockerell, that in the design of a tower and spire for a town church, the entrance, if the lowest story served as a porch, should receive architectural enrichment; all passed it, all could see it, its treatment appealed to every person entering the building. The upper part again, raised high above the roof, is the token that here is a church, and is the appropriate ornament of such a building seen against the sky-line, and as such should be rich and of effective outline. Between these extremes the main wall of the tower is of little use save to lift its crowning feature well above the roofs of the houses among which it stands, and there is no reason, therefore, for it to be other than plain. Almost every one of Wren's church towers conform to these maxims: take Bow Church as an example. The entrance is rich and noble. The crowning feature is characteristic and highly worked up. The intermediate mass,—that is to say, the upper stories of the tower,—cannot be termed anything else than plain. In not a few of the churches that had perished, the tower had been surmounted by a spire, in others by a lantern, and I think I am correct in saying that no Renaissance building which Wren could have seen would furnish the smallest suggestion as to how to make out of Classical materials a spire appropriate to the tower of a parish church, though in Jacobean buildings there were examples of the successful treatment of the lantern. Something like Wren's solution of the problem appears in views of some Spanish buildings; but it is in the highest degree improbable that such examples were known to Wren, even if they were in existence in his day. It is also remarkable that, supposing the dates in Mr. Elmes's life of Wren to be correct, the earliest London church to be completed was one of which the spire is inferior to none in beauty, elaboration, effectiveness, and appropriateness. I refer to Bow Church, which, according to the above authority, was finished as early as 1677. Of this steeple there is an illustration and description in Fergusson's modern volume, and it was excellently illustrated by Mr. J. T. Christopher some years ago. Simpler than this, but extremely graceful, is the spire of St. Bride's, Fleet-street, with its three arcaded stories alike in design, but each smaller and lower than the one below. Above these comes a fourth story, somewhat simpler, crowned with a little spire. The outline of this composition adheres more closely to the straight line of an ordinary spire than any other, and a great charm is produced by comparatively simple means. In the sections nothing strikes the eye more than the constant appearance of a finely-designed dado of oak panelling, beautifully proportioned, which forms a base to the internal walling, and usually clothes the pedestals on which the internal columns stand. Much bold carpentry must exist in the roofs, of which, in some few cases, we can obtain indications, and which appear, as a rule, to have stood well. But it must not be forgotten that this carpentry was executed at a time when oak was the timber habitually used,—a timber of great strength, and capable of remaining unmoved at the joints when framed together. Now we employ fir timber, which is weaker, and in which, unfortunately, the joints cannot be trusted to resist much strain, owing to the soft nature of this wood. The most famous, and probably the most ingenious, of Wren's timber roofs contrived to support a plaster ceiling of elaborate design is that over St. James's Church, Piccadilly; but though that church is one of the best examples of Wren's good sense and skill as a constructor, its exterior is painfully inferior to its interior in design. Here, somewhat unwillingly, I must stop in my examination of Wren's buildings. I will content myself with naming Greenwich Hospital, Chelsea Hospital, the Sheldonian Theatre, Oxford, and the additions to Hampton Court as specimens of his important secular works.

It would, however, be impossible to say anything that would have any value as criticism about these works which Wren carried out, unless I were to omit all mention of Wren's drawings, which, on various accounts, I am unwilling to do It appears to me that they form a part of the subject of much interest to us who are mostly ourselves engaged in making architectural drawings. There exist at St. Paul's two large volumes of working drawings which were used on the building, and these, by the great kindness of Mr. Penrose, I was permitted to examine a few days ago. Many of them are clearly from Wren's own hand, and in the case of others, which appear to be draughtsman's work, one frequently finds along with the drawing the original draft by the master. Few of these are large drawings, though some of them are to a large scale; but, as a rule, each drawing deals with a portion of the building, and does so very thoroughly. The great bulk of what I examined are masonry drawings. The drawing is clear, definite, and unhesitating; a very clear line is used, and the profiles of mouldings are drawn with such precision that some of the ½ in. scale masons' elevations,—for example, those showing the entablature of the order used,—might almost have been worked from without profiles being furnished. One of the most interesting of these drawings is a plan of part of the piers supporting the dome, with superposed over it a plan of the structure at a higher level showing exactly how much of the drum rested directly over the great piers, and how much on the great arches that go from one to the other. An extremely interesting drawing, in part, I think, by Wren, and one among the few that could be called general drawings, is a careful elevation of the entire west front in outline, the treatment up to the apex of the pediment being what we see; but the upper part showing the dome and western towers before the last revision. A remarkable detail drawing, full of energy and vigour, and yet precision, and undoubtedly an autograph, and necessarily executed when Wren was an old man, shows the ball and cross on the summit of the lantern, with the whole of the rather elaborate system of ties and bolts by which they are held down, and the foundation upon which they are formed. It is remarkable to note how thoroughly the author of all these working drawings seems to have been aware of just what guidance the mason or other workman required; and carefully, definitely, and unmistakably that guidance was given. Sir Christopher Wren as a draughtsman may perhaps, however, be best understood by a study of the large but miscellaneous collection of his drawings in the library of All Souls College, as there studies, general drawings, first sketches, and finished plans are all to be seen. These, by the courtesy of the authorities, I have very recently inspected and examined for the purposes of this lecture. In four large folio volumes are stored part of the contents of the great architect's portfolios; fortunately that part includes a good many drawings belonging to the series made for St. Paul's, along with many connected with his other works. In one or two cases we can here trace the way in which he worked, and though there may be a doubt about some drawings, whether they are his own handiwork or no, and a certainty about others that they are the work of an assistant, there remains a large body of work about which no one accustomed to architectural design can entertain any hesitation as to their being the manuscript work of the master just as he left it. Curiously enough, there is extremely little writing on these drawings, though I note with some interest, as falling in with a strong prejudice of my own, that there is a scale on not a few. The autograph drawings were evidently for the most part rapidly produced, yet with a strong leaning towards precision and exactitude. Nearly all of them are in ink, and brown ink is usually employed, and the elevations are often washed a little in Indian ink, while plans and sectional parts are sometimes left uncoloured, sometimes coloured red, and not unfrequently etched. There is a great preponderance of plans, and the geometrician shines out in all of them. In not a few cases the centre lines and setting-out marks remain in pencil, and it is interesting to note how constantly Wren worked from centres and centre lines. In his sketch of the approved plan of St. Paul's, for example, a centre line in pencil runs up the nave and choir, and a similar line up each aisle from end to end of the plan; but it is in his sketch of the ground-plan of the earlier design, which we may call the model design, that these centres and centre lines are most visible and most interesting. It is possible on this drawing to learn the whole process adopted in setting out that intricate and remarkable plan. An elevation, clearly and firmly drawn, and vigorously shaded in lines, accompanies this plan, and there is also a section washed. These drawings strike one as perhaps the most masterly in the series, and are, without doubt, autographs. I have already alluded to Wren's autograph drawing,—for it is clearer than a sketch,—for the approved plan. There is also a sketch by him of the singularly weak elevation which accompanied it. The finished drawings submitted to the king are here. They may or may not be his handiwork,—probably not. A very interesting drawing in connexion with St. Paul's is a pencil study in perspective of the interior of the present cathedral, hasty in execution, but true. There are other studies in perspective in the series, bearing out an injunction of the master's in one of his essays on architecture. "The architect ought, above all things, to be well skilled in perspective, for everything that appears well in the orthography may not be good in the model, especially where there are many angles and perspectives; and everything that is good in model may not be so when built, because a model is seen from other stations and distances than the eye sees the building. But this will be universally true, that whatever is good in perspective, and will hold so in all the principal views, whether direct or oblique, will be as good in great (*i.e.*, *in execution*) if this only caution be observed,—that regard be had to the distance of the eye in the principal station." Not the least instructive piece is a very small perspective study of Greenwich Hospital, in-

tending apparently to show him how the two domes would look. Another drawing of St. Paul's, which, though probably an assistant's work, possesses historical value, is a careful south elevation of the cathedral, corresponding to the outline west elevation already named by me. Up to the parapet, this drawing, which is carefully tinted and shaded, shows the building very nearly as erected; but it is interesting to note that the design of the upper part, both of the dome and the west tower as it stood at that time, was not what was ultimately carried out, and not anything like so good. Where the drum surrounds the building there was then prepared a series of buttresses, each one ending in an engaged column. This feature—of which, by the bye, a plan exists in the St. Paul's collection carefully elaborated—has now given place to a smaller number of large piers with columns between. There are some other differences in the dome, and especially in the lantern; but the change in the west towers is even more marked. At the time when the drawing was made it was intended that a small dome should surmount each western tower, and the extremely elegant composition in which these towers actually finish is not figured on the drawing. Perhaps in nothing did Wren make a greater improvement than in the design of these campanili. In connexion with the dome of St. Paul's I may name an extremely careful study (which I entertain little doubt is an autograph) of the two great domes of St. Peter's at Rome and Sta Maria dei Fiori at Florence. At the bottom of the sheet is a quarter plan of the one and a quarter plan of the other, and set up over each is drawn carefully a half-section, a centre line separating the two; while on a separate part of the sheet is a portion of the plan of each dome at a higher level. This drawing is carefully and broadly executed. As usual, it is in brown ink; it is slightly shaded in sepia and the sectional parts are tinted in a colour something like Venetian red. The baldacchino, and other ornaments in the interior of St. Peter's, are most beautifully drawn; but the human heads, &c., are not well done, and it is noteworthy that wherever the figure is introduced into the undoubtedly autograph drawings the draughtsmanship is imperfect. Nothing could be better as a study of great domes than this drawing, and the pains taken with the work, and the precision and care of the execution, are most instructive, as showing the trouble which a great man considered he ought to take in order that he might master the two most famous domes in Europe, which he studied as examples of work similar to what he was himself charged with. In a different way one of several carefully-finished drawings for Bow Church is interesting. I have it from Mr. Christopher that there is a tradition that, when Bow Church was first designed, Wren proposed a lantern on the tower; but the parish, being wealthy and influential, desired to have something more ambitious. Accordingly Wren redesigned the spire, adopting something of the same outline, but vastly expanding it. Being, however, pleased with his lantern, he employed it for the tower of another church, St. Magnus, London Bridge. Accordingly here is an elevation of Bow Church, with the lower part of the tower as built, but the upper part quite different, and bearing a close resemblance to the picturesque lantern so conspicuous an object to those who daily cross London Bridge, which crowns the above-named church. A drawing which is extremely instructive, as showing how Wren worked, is an unfinished pencil study of the campanile of a building (No. 85, in the 4th volume). This was to have been in four stories of unequal height, and it bears so great a resemblance to the lower part of St. Bride's spire that I take it to be an early study for that design. Half the drawing was to have been a section on half his elevation. How the proportion between the heights of the stories was arrived at the drawing does not show; but their projection was regulated by drawing a sloping line from the top of the tower (exclusive of a cornice) to some point (out of the paper) on the centre line, and the projection, and consequently the height, of each cornice, was regulated by a second similar line from the edge of the lowest cornice. I had long been aware that the section of the dome of St. Paul's conforms to a similar line, and it was, therefore, extremely instructive to find another composition in course of being worked out by the aid of such a line, and to find the whole machinery of working left visible. Another noteworthy feature of this unfinished design is that Wren had apparently intended, as his manner was, to carry the highest story of this construction by means of a kind of internal tower resting on a stone vault, or else to provide for a stone stair resting on a masonry arch; and in this section he had taken the trouble not only to show the outline of the vault or arch, but to indicate every voussoir, and to show how he proposed to work the extrados of each stone so as to form a kind of step. A staircase in exactly this position is shown in Clayton's drawing of St. Bride's church spire. Another instructive pencil drawing in this series is one identified by Mr. Penrose as a plan of the north-west tower of St. Paul's. This exhibits the construction of the tower at four levels. It was rapidly done, and, contrary to custom, no attempt to ink it in has been made; but it shows what it is meant to show sufficiently to enable a working drawing to be made from it, possibly sufficient to guide a good mason, accustomed to Wren's work, without further details in setting out the masonry and building it. A set of six very careful drawings, which Elmes refers to the year 1665, embodying the design of a library for St. John's College, Cambridge, deserve a notice as an early work, and as being accompanied by a report which exists in Wren's handwriting, and is printed in Elmes's life. From this report it appears that no such thing as keeping copies or duplicates was in use in Wren's time, as he asks that, when enough has been taken off from these drawings to permit a start to be made, the originals may be returned to him in order that he might give details for the mouldings. With these drawings there is a very spirited sketch in perspective, doubtless from Wren's own hand, of a reading-table and desk, such a drawing as would be a sufficient guide to a good workman. The collection includes a series of large and highly-finished drawings for Greenwich Hospital, probably prepared to show to the king, and entirely draughtsman's work. There are plans of alterations, surveys, and miscellaneous traces of a large practice, and of the various calls which it makes on time and trouble. One considerable plan is noteworthy for being sketched on paper previously divided up with pencil lines into squares, just like what is called "section paper" by engineers at the present day. There are a good many sketches of plan, mostly in ink, drawn to a small scale, and apparently without the use of a ruler, such as lead one to surmise that Wren possessed the faculty which is, from time to time, met with in architects, of being able to sketch the plan of an existing building or locality approximately true to scale, with but few dimensions to guide him. I ought not to omit that a few pencil sketches,—mostly of scenes including some building,—usually some mansion, but in some cases of picturesque spots interesting to a passing traveller—are preserved. I am inclined to believe that these are all Wren's. They are boldly and roughly drawn in pencil, trees are indicated by an impatient scribble, and the buildings are hurriedly drawn, but sufficiently well to show what they were, and the perspective is always good. These must not be looked upon as studies; they are a traveller's jottings. The shape of them is curious; they are almost all long and narrow, and with a crease in the middle, as though a sheet of paper had been cut into long strips, and then each one doubled and shut into a book or folio till wanted. The sum of these rather desultory observations may perhaps be this. The drawings show Wren to have been a rapid, free, but very accurate geometrical draughtsman. Geometry seems to be suggested by his methods as the inspiring motive of his work, as one might indeed expect to find it, when one reads in one of his fragmentary essays the following words:—"It seems very unaccountable that the generality of our late architects dwell so much upon the ornamental and so lightly pass over the geometrical, which is the most essential part of architecture." The contents of these folios testify to a fertile invention; but, I am inclined to think, not a fastidious taste. Wren seems, probably from having a great pressure of work to encounter, to have been apt to content himself with the first idea, and that not always a good one; but it is to be observed that in execution he generally revised and refined where, as in the case of St. Paul's, his constant supervision of the work gave opportunity for doing so. It appears pretty clearly also that structure was never absent from his mind. Not only were his designs things that could be built, but from the first the question of how to build them was considered at the same time as the question of what shape to give them, and long before the question of what ornament to bestow. The two or three professional reports and estimates preserved at Oxford concur with the various papers given in the "Parentalia," to produce the impression upon us of a most trustworthy, methodical, sagacious, energetic man of business, and it is almost as interesting to turn over these fragments of his writing and calculating as to scan his drawings. The whole thing brings the man himself very near to one; you trace the lines he drew, note the very holes left by the point of his compasses, you try to infer his modes of thinking and working from the traces here left, and you come away feeling as if you had had a glimpse into his very mind, and had seen him alive and at work; a feeling to which the cast of his features taken after death, and preserved in the Library, gives a pathetic tinge, for so startlingly real is it that the sight of it is much as though one had seen the old artist in his coffin. Here, gentlemen, I propose to leave the subject, and if, in addition to giving you some information, I have succeeded in to any extent awakening your interest, and possibly have caused you to reflect that some lessons for the guidance of a nineteenth-century student of architecture may be gathered from the example of this keen investigator and strenuous worker of the seventeenth, my object in asking you to meet me to-night will have been fully attained."

## SANITARY CONGRESS AT WORCESTER.*

Continuing our notes of the Sanitary Institute's Autumnal Congress at Worcester, we may first of all make brief mention of a paper by Mr. J. T. Arlidge, M.D., F.R.C.P., on "The Sanitary Aspects of the Pottery Manufacture." In it the author noticed the sources of danger to health in the materials employed,—in the clay, flint, lead, and colouring matters; in some of the processes as carried out; in the high temperatures so often involved; and in the modes of working. Over and above all such intrinsic conditions, he briefly called attention also to collateral or extrinsic circumstances affecting the well-being of pottery artisans. But of all the causes of illness to be discovered, dust from the clay stands pre-eminent, and happily it is one that can be overcome to a great extent by those means of ventilation and of extraction modern mechanical science has brought to so great perfection. He concluded by adding that there have been vast changes for the better during the last twenty years and upwards that the factory laws have been enforced. Child labour has been greatly curtailed, work rendered much more regular, and that at night practically almost abolished; numerous new factories, well built and roomy, have taken the place of dilapidated, damp, and confined structures; machinery has been introduced, reducing materially the number of unskilled hands employed, facilitating work and giving it greater development; means of ventilation by fans and other contrivances have been adopted in most factories where there is steam power, with a consequent enormous reduction of the most active cause of illness, the inhalation of dust; and, as might be anticipated, improvements in the mechanical and general sanitary conditions of their labour have been accompanied by a perceptible material and moral advancement of the employed. There is, nevertheless, ample scope for more; and ever onward progress may surely be looked for in proportion as more correct notions of sanitation extend themselves among all classes; as the ingenuity of mechanicians improves the appliances of labour and invents means for lessening evils attaching to it, and as education spreads and succeeds, instructing artisans in their true interests, both in respect to morals and to health.

The Section devoted to "Engineering and Architecture," was opened on the morning of Thursday, the 26th ult., when the President of the Section, Mr. Henry J. Marten, M.Inst.C.E., delivered his opening address. In the course of it, he took a retrospect of some of the advances made during the last forty years in connexion with fen drainage, town and village sewerage, house drainage and domestic sanitation, water supply and fittings, smoke consumption, and other matters. On the subject of town drainage, he said:—

"I remember the early reports of the Sani-

* See *Builder*, p. 236 *ante*.

tary Inspectors of what was then termed the Board of Health, as to the state of things forty years since, with regard to these subjects. The reports disclosed, as then almost universally existing, a most horrible state of affairs, which is now, happily, only exceptional. Open and almost stagnant sewers in close proximity either to the front or back doors of rows of houses, and, whilst festering there, giving off large volumes of poisonous gases. Leaky dumb-wells, sunk in porous ground, receiving the sewage from large numbers of houses, with the pumps for the supply of the said houses drawing their water from shallow wells sunk in close proximity to those dumb-wells. Drains, where they did exist, untrapped, and through which at night, when all the doors and windows in the house were closed, the only supply of air for the inmates could be obtained. Sewers, properly described as only 'elongated cesspols,' much too large for the work to be performed, constructed in many cases of porous materials, of very unscientific section, and with but little regard to gradient.

No one whose memory does not carry him back to that period can now conceive of the amount of ignorant and selfish opposition which Mr. (now Sir Edwin) Chadwick encountered, when, acting as Secretary to the Board of Health of that period, it became his duty to call public attention to this state of things, and to suggest the remedies for them.

One of the great difficulties with which Sir Edwin Chadwick had to contend was the then existing idea that every sewer must be a 'Cloaca Maxima.'

Classical gentlemen when visiting Rome were shown, amongst the other antiquities of the place, the mouth of that sewer, and being in the humour to fall down and worship any work of the imperial and practical Romans, they, of course, fell down and worshipped that particular work, which was all very well in its place, but which was not adapted for universal and indiscriminate application. If this worship had been in the nature of a 'silent cult' it would probably have done very little harm, but, unfortunately, the worshippers were zealous to make proselytes, and everywhere preached the doctrine of large sewers—'nothing smaller than such as a full-grown man could walk upright in,'—and, in fact, everywhere and for all sewage purposes, 'Cloaca Maxima, Cloaca Maxima,' was the cry. . . . . Shortly after the advent of Sir Edwin Chadwick, however, 'Cloaca Maxima' worship received more of that gentleman's attention than its worshippers altogether appreciated; and after being severely wounded in several vulnerable points by that veteran sanitarian, this form of worship was, after a severe struggle, finally and ignominiously done to death in, I believe, a backyard in Westminster.

The way of it was this. Some practical but scientific sceptics one day took a peep into one of the old-fashioned metropolitan 'Cloacæ Maximæ.' To their astonishment they found more than four-fifths of the sectional area of our 'Cloaca Maxima' filled with putrid mud, over the top of which a little stream of gas-bubbling sewage was dribbling along; that is, they found the boasted 'Cloaca Maxima' to be nothing more than a putrid mud trough with a trickle of sewage passing through it.

Having digested this fact, they bethought themselves of trying what would happen if this trickle of sewage were passed through a small glazed earthenware pipe.

Pursuing this inquiry in a methodical and practical manner, a length of such small earthenware pipe was laid down, and the 'Maxima Cloaca' quantity of the sewage was poured down its throat, and to everybody's astonishment the little 'pot-pipe' accomplished not only all that 'Cloaca Maxima' did, but even more, for it not only freely discharged the whole of the sewage passed into it, but left no festering sediment behind in the pipe.

Here was a great fact established,—namely, that a small glazed earthenware pipe, laid at the same gradient as 'Cloaca Maxima,' could not only discharge all the sewage usually passed by its big brother, but was, in addition, 'self-cleaning,'—that is to say, it not only left no sedimentitious matter in it, but removed any extraneous matter purposely placed therein.

Now began the battle between the 'Cloaca Maxima' principle and what in derision was termed the 'pot-drain,' and a right royal battle it was. Architects, engineers, and builders were at first almost universally on the side of 'Cloaca Maxima,' whilst 'pot drain' was supported by Sir Edwin Chadwick, backed only by stubborn facts. However, after a hard struggle little 'pot drain' gained so complete a victory over 'Cloaca Maxima' that even its greatest devotees were eventually obliged to discard it as a species of antiquated demon worship. This is the early history of our present system of sewage removal by water carriage, and so complete has been the revolt from the 'Cloaca Maxima' principle, that I may mention as an instance of its discomfiture I have for several years past, without stoppage or inconvenience, been passing by gravitation, up hill and down dale, the whole of the sewage of Dudley, a town in this county, containing nearly 30,000 inhabitants, through a pipe five miles in length and only 13 in. internal diameter."

Among the papers read in this section was one by Prof. Henry Robinson, M.Inst.C.E., on "Sewage Disposal," in which he briefly reviewed new processes and proposals. His concluding remarks were as follow:—"The regulations which are enforced in this country to diminish death-rate by proper sewerage and sewage disposal works should be applied abroad, wherever our influence can be exerted to mitigate sanitary evils which abound in many great centres of population in the British Empire. At the recent International Congress of Hygiene in Paris, the insanitary condition of Alexandria was referred to, and its state was denounced as a danger to all Europe. The necessity for properly dealing with the sewage of Calcutta has long been recognised, and it is understood that steps are being taken to remedy the existing unsatisfactory state of things that prevails there, Mr. James Kimber, C.E., being now engaged in advising the Commissioners of that place what ought to be done. Numerous similar large centres of population under our influence could be quoted where much-needed sanitary reforms are demanded. There is a great waste of public money throughout the country in regard to sewage disposal. Many towns are continuing the employment of systems which have long since been superseded, and I consider that a time has arrived when an investigation by an impartial and qualified Commission into the question of sewage disposal would lead to most valuable and useful results to the community, both from a sanitary and economic point of view."

Mr. Robert Godfrey, Assoc.-M.Inst.C.E., also read a paper on "The Amines Process of Sewage Treatment," a process which we described and commented upon in the *Builder* for September 21 (p. 206).

Mr. Henry Law, M.Inst.C.E., read a paper on "A Method of Regulating the Maximum Discharge of Sewers," and Mr. Harry R. Newton, F.S.A., F.R.I.B.A., followed with one "On the Errors of Exposing Sewage to Light and Air, and on the Remedy for such Evils." Mr. B. H. Reeves also read a paper "On Experiments in Sewer Ventilation, considered in relation to the Public Health." To these three papers we may return.

Professor C. R. C. Tichborne, F.I.C., read a paper on "The Interception of Miasmatic Emanations from the Subsoil of Dwellings." In the course of it he said:—"Centuries ago the Romans had arrived at a knowledge of the requirements of a good dwelling-house, which puts us in the year 1889 to the blush. Vitruvius would smile at our modern hygiene. One of the points which received their special care was the construction of their basement floors, the barrier between miasma and their domiciliary supply of air food. When a man lays his head upon his pillow to enjoy those precious eight or nine hours of rest, does he, in nine cases out of ten, breathe the natural atmosphere of the district, wherever that may be? In my opinion he does not. He has simply placed himself under an inverted bell-jar, or a structure of a similar nature, which collects, and before morning is filled with, the volatile sweatings of the surface soil. This soil is distilling (I use the term as being strictly correct) into the building all the contaminations which it has received during the day. But the soil has besides its special poisons, which it generates in its own laboratory. The old Roman mansions were protected by layers of concrete, and one of these upper layers consisted of powdered charcoal. Some little attention has been given, within the last few years, to the subject of basement floors, but chiefly in isolated cases, where scientific men have personally superintended the construction of their own houses. Wherever trouble has been expended it has been attended with the best results. I state this not from hearsay, but from personal knowledge. In approaching upon a scientific basis the subject of the concreting of basement floors, the following question at once presents itself to our minds: What is the actual extent to which cement will prevent the passage of miasmatic or deleterious vapours. Deleterious vapours may be divided into two distinct classes: 1st, the permanent gaseous poisons, such as sulphuretted hydrogen; 2nd, organisms such as microbes, baccilli, &c. Where the first class ends and the second commences it will require the bacteriologists of the next century to define, and for our purposes it will be as well to consider them as distinct forms of matter. First, then, to consider the question of porosity, or in other words, how far are these different cements capable of passing gases. This point is roughly, but efficiently, determined by the following simple experiments, or series of experiments:—

Thin tubes were taken, 1 ft. long and ¼ in. internal diameter. These were carefully plugged with the cements to be tried, an exact inch of each cement being set in the ends of the tubes. Some of these tubes were allowed to stand four months before being used, so as to get perfectly set. The following materials were used as being typical:—No. 1, fine mortar, made by adding one part quicklime to two of sand; No. 2, plaster of Paris or anhydrous gypsum; No. 3, Roman cement; No. 4, Portland cement; No. 5, hygienic cement. This last is a cement with which we have obtained some very successful results in Dublin, and many of the tests given further on prove that it is specially applicable to basement floors. The specimen experimented with contained about five per cent. of carbolate of calcium, naphthaline, &c.

These different tubes were air-dried; each tube was then closed at the end by an india-rubber cap, which could be removed at will. They were then filled with mercury and inverted in a mercurial trough, so that a toricellium vacuum was formed in each tube. The caps were then removed, and by observing the order in the fall of mercury, the relative porosity could be determined. It stood in the following order:—

| | Relative amount of Porosity. |
|---|---|
| 1. Mortar | 100 |
| 2. Plaster of Paris | 75 |
| 3. Roman cement | 25 |
| 4. Portland cement | 10 |
| 5. Hygienic cement | 10 or 8 |

Their relative position as regards porosity could be determined with certainty; but in the second column is an endeavour to give the relative amount of porosity. This last column, although it conveys a very good idea, is only a rough approximation. It was arrived at by performing a number of experiments, and noting the respective times the mercury took to fall. Even if elaborate apparatus had been constructed to arrive at these results with great precision, such precise experiment would be of little use, as hardly two samples of similar kinds of cement would agree to a nicety.

The fall of a foot of mercury, in the case of mortar, is called one hundred, because it is the most porous material,—in fact, it is almost instantaneous, and lasts about half a second. It can just be followed with the eye. The Portland cement is extremely slow, the last inch of mercury taking nearly a quarter of an hour.

A series of experiments were then performed with similar tubes, to determine the rate of diffusion of gas through these different materials. These experiments are confirmatory, but yet in a degree are distinct from the previous ones in their bearing. In such experiments we are drawing important inferences as to how layers of these different kinds of materials would influence what has been aptly called the "ground respiration." Any gas that may pass through such septums or layers of cement will obey Graham's law of diffusion, viz.:—That the rate of diffusion is in inverse ratio to square-root of their gravity. Hydrogen was the gas selected to try against atmospheric air. The tubes were again capped with indiarubber, and were filled by displacement with hydrogen gas. They were then inserted into a trough of water, and the caps were removed. A partial vacuum was created in each experiment, which raised the level of the water in each tube according to the respective rate of the diffusing hydrogen, which, as it was the lighter gas, passed through more rapidly than the atmospheric air passed in.

The relative heights of the column of water,

above the level in the trough, are given according to the time observed.

| | Min. | Mins. | Mins. | Mins. | Mins. |
|---|---|---|---|---|---|
| | 1 | 3 | 13 | 20 | 30 |
| | in. | in. | in. | in. | in. |
| Lime mortar | ½ | ¼ | 0 | 0 | 0 |
| Plaster of Paris | ½ | 1 | 2¼ | 2 1/16 | 0 |
| Roman cement | ½ | 1½ | 2 | 2 7/16 | 1 |
| Portland cement | ½ | 1 | 1½ | 3½ | 3½ |
| Hygienic cement | ½ | 1½ | 1 13/16 | 3 1/16 | 2½ |

It will be observed that lime-mortar is hardly worthy of being called a septum, and is practically without any controlling action upon gases—in fact, under such circumstances, it should be viewed merely as a coarse sieve. It could not exert any control over ground respiration. In the case of the cements it is very perfect, but necessarily slow. The practical reading to my mind is that any ground gas would pass through such materials as the hygienic cement very slowly, if at all, because the atmosphere being of a lighter density than such gas as sulphuretted hydrogen, or carbonic acid gas, a downward diffusion would take place; or we may put it that a ground inspiration would be set up, and that atmospheric oxygen would be carried into the surface soil. The atmospheric oxygen would oxidise the noxious organic matter exactly on the same principle as it destroys the pollution of rivers—if we only keep the organic matter in a sufficient state of attenuation.

So far, we have merely treated the question of gaseous diffusion, but it is probable that the most important part of the investigation is the action of cements on the germ contamination. Tyndall has pointed out that plaster-of-Paris, and even a surface of strong sulphuric acid, is incapable of separating germs. In fact, the only filter which he found successful was cotton wool. This observation has been thoroughly indorsed and made use of by subsequent workers in bacteriology. Now, to determine the action of cements in separating germs, a series of Pasteur's retorts, or flasks, were filled with sterilised hay-infusion, and were then plugged with different cements. The retorts, contents, and plugs were all sterilised at a temperature of 212 for some days. On being closed they were placed in an incubator. In a short time all of these solutions went with the exception of the hygienic cement—one which is perfect still.* It is also interesting to observe that the next best flask is the plain Portland cement. There is only one conclusion to arrive at,—that the air, in passing through this inch of hygienic cement, was perfectly sterilised.

Asphalte acts as a perfect plug, but I should say that it is objectionable, because, if we have every large area cemented by this material, the surface gases will be more or less under pressure, and if so will force their way through any of the numerous cracks and fissures, which must exist in an ordinary house; besides this, it will largely permeate up the walls, which we now see are formed of very porous material.

As regards the permanency of the antiseptic action of hygienic cement, I may as well give here the analysis of a sample of concrete made with it and laid down in Gray's Inn-road in 1885.

It was taken up in 1889, when it gave on analysis:—

| | |
|---|---|
| Moisture | 3·00 |
| Antiseptic matter of an extractive nature. | 1·96 |
| Carbolic acid | 0·14 |
| Granite with cement | 94·90 |
| | 100·00 |

When broken it smelt strongly of the antiseptic used.

I believe that these experiments throw considerable light upon the question of atmospheric contamination from the basement of houses, and I have, therefore, thought it desirable to place them in a concise form before the Sanitary Institute."

**Croydon Improvements.** — The Croydon Town Council unanimously resolved on Monday last to apply to Parliament for powers to purchase by compulsion property in High-street, Middle-row, and Surrey-street, in order to widen the High-street, and abolish a series of rookeries behind. The scheme will cost at least 100,000*l.* and has been before the local authority nearly thirty years. The Council have already decided to acquire the Central Croydon Station of the Brighton Company and land adjoining, and to erect a new Town Hall and municipal buildings, including a central free library.

* September 19, 1889. Three weeks old.

## THE LONDON COUNTY COUNCIL.

THE first meeting of the London County Council after the summer vacation was held at the Guildhall on Tuesday last, Lord Rosebery presiding. Before the ordinary business was proceeded with, the Chairman referred to the untimely death of the Deputy-Chairman (Mr. Firth). Lord Hobhouse moved, and Mr. Fardell seconded, "That this Council desires to place on record its sorrow for the severe loss it has sustained by the untimely death of Mr. J. F. B. Firth, who, by his industry and ability in obtaining a perfect mastery of London affairs, and by his courtesy, patience, and devotion in discharging the arduous duties of Deputy-Chairman of this Council, has rendered priceless services to the inhabitants of London." The resolution was carried, and it was resolved that a copy of it should be forwarded to Mr. Firth's widow.

*Strand Improvements.*—The Improvements Committee having been entrusted, by resolutions passed by the Council on April 9 and May 7 last, with the consideration of "the best method of increasing the accommodation for vehicular traffic in the Strand, having regard at the same time to the desirability of preserving the church of St. Mary-le-Strand," now reported that they were not at present prepared to report upon the whole of the questions embraced in the above references, but that they thought it desirable, as time pressed with regard to the requisite Parliamentary Notices, to report upon that part of the subject which has reference to the widening of the narrow portion of the Strand which lies between the churches of St. Mary-le-Strand and St. Clement Danes. The report of the Committee goes on to state that:—

"The part where the greatest obstruction to traffic exists is between Surrey-street and the church of St. Clement Danes, a portion of which measures only 40 feet in width, and it is manifest that the widening of this portion of the thoroughfare is a matter of the most pressing necessity. Your committee have no hesitation, therefore, in advising the Council to apply for powers to demolish the block of buildings on the south side of Holywell-street, and it may be pointed out that if this be done the Strand will offer a favourable comparison with the eastern sections of the line of thoroughfare of which it forms part (Fleet-street, Ludgate-hill, and Cheapside).

No doubt the accumulation of vehicles at the time of exit from the theatres is considerable, and imposes serious difficulties upon the police; but it must not be forgotten that if the Strand were widened sufficiently to comfortably accommodate this traffic, it would have to be very considerably wider than at present, which, of course, is out of the question.

In addition to the removal of the buildings on the south side of Holywell-street, it appears to your Committee desirable that powers should be obtained to deal with the enclosed land adjoining the two churches, and also to make better arrangements than those which now exist with regard to the places of convenience in the locality of the two churches. The recommendation which your Committee have now to submit is as follows:—'That the Council do apply in the next Session of Parliament for powers to remove the block of buildings on the south side of Holywell-street, and to deal with the enclosed spaces, together with the public conveniences adjoining the churches of St. Mary-le-Strand and St. Clement Danes.'"

This report called forth considerable discussion, the recommendation of the committee being supported, amongst others, by Mr. Augustus Harris, who said that while many improvements had recently been effected in every part of the Metropolis, nothing had been done in the Strand. The smallest contribution would be thankfully received, and he hoped that the committee would not prevent some portion of the proposed improvement being considered. Colonel Hughes and Mr. Harben objected to their going to Parliament at present, before they knew what the cost of the improvement would be.

An amendment was moved to the effect that the matter should be referred back, but was lost, as also was an amendment moved by Mr. Beachcroft, to apply for power during the next Session of Parliament to deal with the widening of the Strand between the churches of St. Mary-le-Strand and St. Clement Danes.

The Chairman said that if the improvements were postponed until next year, that would be the last year of their existence. He thought that they ought not to reject a partial improvement, provided it would not interfere in any way with a larger scheme. The recommendation of the committee was ultimately approved, the voting being—for the recommendation, 50; against, 36.

Reports from the Bridges and Building Act Committees were brought forward and passed, and soon after the Council adjourned.

## FURTHER NOTES OF THE SANITARY EXHIBITION AT WORCESTER.*

THE "Archer" air and water tight sewer-pipe joint, which was described and illustrated in the *Builder* for July 14, 1888, and was again referred to in our columns on Jan. 12, 1889, is exhibited under rather trying conditions. Two lengths of stoneware pipe with Archer's patent joint are placed girderwise on bearings as far apart as the two lengths of pipe will allow, with the joint in the centre of the span. This improvised beam or girder is then loaded with a load of more than one hundredweight, but it stands the ordeal well. Other lengths of jointed pipe are placed on end and used as water-reservoirs (the bottom end being plugged up), without any leakage being apparent at the joints.

The Westminster Patent Flooring Company exhibit their "Disc-Key" block flooring, which is worth notice.

The Worcester Sanitary and Ventilating Company exhibit what appears to be a very good warming and ventilating grate, the outer air being warmed by passing through the fireclay back. They also show "Lloyd's" patent joint for soil and waste-pipes, which consists, briefly described, of an annular socket, into which the next length of pipe fits, whitelead, putty, or some other cement or stopping being previously placed in the narrow annular space. This form of joint may answer for external pipes, but we should be very chary of using it for internal soil-pipes or wastes. Buchan's disconnecting trap, Steven's range ventilator (a very desirable thing to use with close kitcheners), a sluice-valve for flushing drains with their own contents, a very good form of slop-pail with valve-lid, and a sanitary dust-bin, are among the many useful items of this stand.

Moule's earth-closets, Morrell's dry-closets and cinder-sifting dustbin, and Nicholls & Co.'s antiseptic pail-closets, may be mentioned together, although they are exhibited on different stands. They each and all have their special merits for use under particular circumstances.

At Stall 8, the Sanitary and Economic Association of Gloucester have a very good display of wash-out and other types of closet, as well as other sanitary appliances, including Angell's improved airtight man-hole covers. Some instructive diagrams illustrate the dangers of bad plumbing work, and show the methods of doing the work properly. These diagrams are further enforced by an "object-lesson" in the shape of a number of "horrid examples" of bad plumbing work.

At Stall 13, Messrs. Peters, Bartsch, & Co., of Derby, exhibit their preparation, known as *Carbolineum Avenarius*, for the preservation of wood. This was noticed in our columns a few years ago, and, judging from the statements made with regard to some specimens exhibited showing tests made by the Midland Railway Company, there appears to be some virtue in the preparation. The same firm also exhibit a preparation named "anti-oxide," for the preservation of iron from rust.

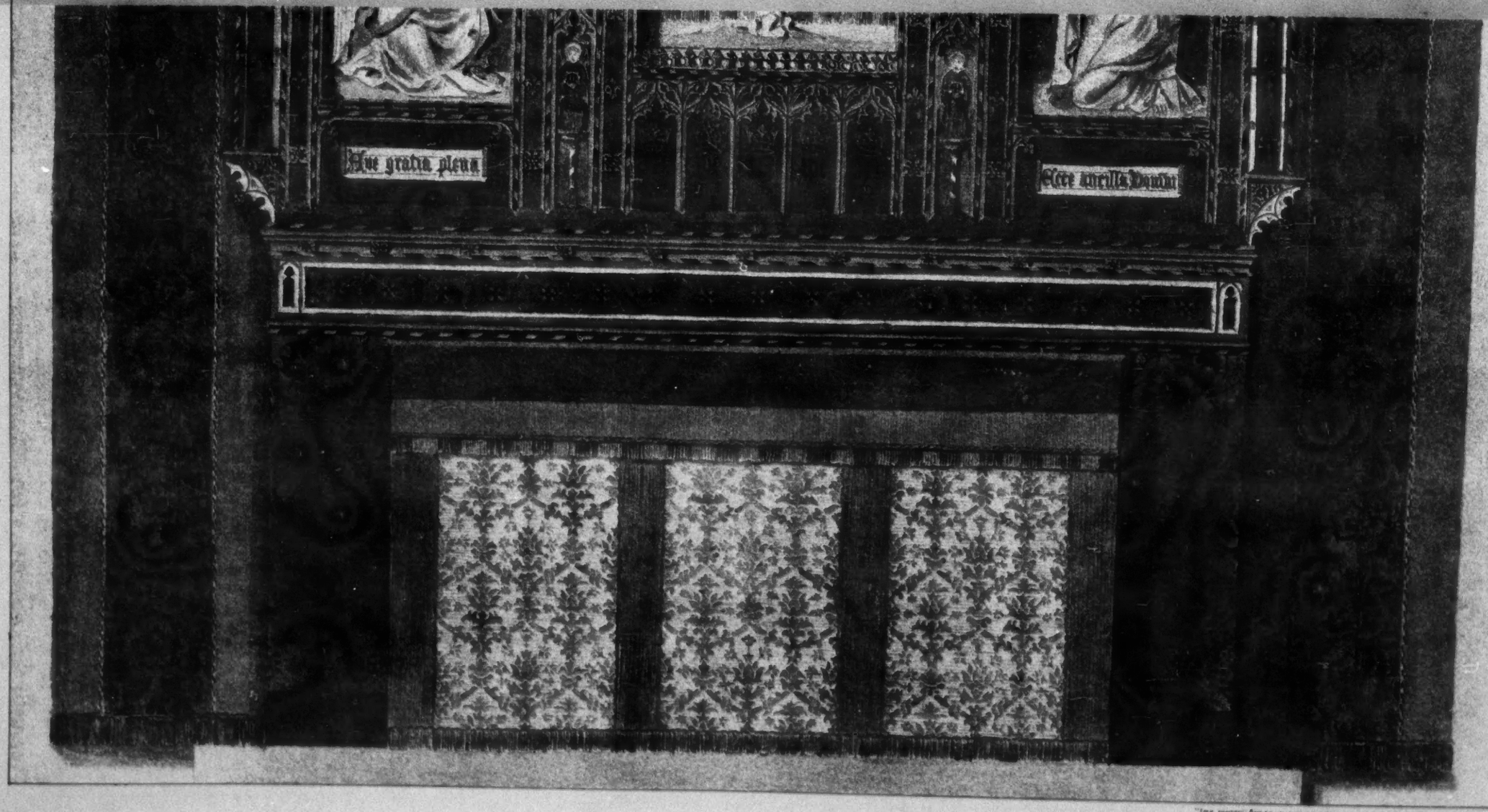
Messrs. C. Kite & Co., of London, have, as usual, a very good display of ventilators, through one of which, of the water-jet type, and 8 in. in diameter, we are assured that 26,000 cubic feet of air were passed in an hour, with a consumption of about 25 gallons of water.

Messrs. H. & C. Davis & Co., of London, make a good show of their "Metropolitan" and other gas-stoves.

At Stall 20, Webb's Worcester Tileries Company make a very good display of encaustic, wall, and other tiles, which, while good in design and colour, have an obvious sanitary value.

Messrs. Joseph Cliff & Co., of Wortley, exhibit some admirable enamelled fireclay baths, sinks, &c. They also show a number of specimens of their new "Wortley Faience," one variety of which is called "Malachite ware." Among their other exhibits is a "Roman-shape" enamelled fireclay bath, with parallel sides; a hospital bath, of fireclay, enamelled both outside and inside, to facilitate cleansing, and to stand without any casing or enclosure; a very good hospital slop-sink; and the "Cecil" slop-sink, with a flushing-rim.

* See p. 221, *ante*.




REREDOS ERECTED IN ELVETHAM CHURCH, HANTS.—Mr. A. H. Skipworth, Architect.

Mr. H. Trott has a bright and showy stand of cases, containing water fittings and valves, and plumbers' brasswork generally.

Messrs. Croggon & Co. have on view a number of galvanised wrought-iron sanitary dust-bins and cinder-sifters, including Clague's patent dust-bin and cinder-riddle. We are glad to see that appliances of this sort are superseding the old-fashioned, ill-constructed, rarely-emptied, and altogether insanitary yard or area dust-bin.

Messrs. Manlove, Alliott, Fryer & Co., of Nottingham, have a very good display of machinery and appliances, including Washington Lyon's admirable steam disinfector for laundries and public institutions; also models of Fryer's "Destructor," with Jones's fume-cremator,—the latter a great improvement. It was described in the *Builder* a year or two ago. Models of sludge-presses and filters, and of "Johnstone's patent dryer," for drying offal and other offensive town garbage,—a very ingenious and quite inoffensive apparatus,—are shown by these exhibitors, whose stand is well worth attention by Town Surveyors and others.

Mr. George Slater, of Sheffield, exhibits a useful glass case entitled the "Hygiene Cabinet," which contains specimens, apparatus, and models of sanitary appliances. The cabinet is intended for use in teaching the general principles and practically demonstrating lectures on hygiene and sanitary science. It is a good idea, well carried out.

Jeye's Sanitary Compounds Company (Limited) exhibit not only their compounds, but the ingenious "automatic disinfectant distributor," which was described and illustrated in the *Builder* last week (p. 221).

Mr. Dean (Stall 92), of Guilford-street, London, exhibits his well-known "stench-traps" in an improved form, and a very good grease-trap, with the inlet from the sink discharging below the water line of the trap, so that all new accretions of fat after the initial layer pass into the water below that layer and adhere to the bottom of it. The fat is collected within a wooden float fitted with a metal rim, by the use of which it is claimed that 90 per cent. of the fat passing into the trap is removed at one operation. These and other stoneware goods shown at this stand are made by Mr. J. C. Edwards, of the Ruabon potteries. At the same stand and from the same potteries is shown Messrs. R. Norman Shaw's and T. L. Watson's "Channel Drain-pipe," of which we spoke in a "Note" in the *Builder* for July 20 last. We are still unable to regard it as an ideal form of drain-pipe.

Messrs. Winser & Co., of Buckingham Palace-road, London, exhibit their intercepting sewer-trap; their admirable channel-pipes and bends for manholes and inspection-chambers (favourably noticed by us three years ago when shown at the Sanitary Exhibition at York); the "Dececo" and "Buckingham" closets; Stokes's gully-trap, specially adapted for giving access to the drain-pipe on the sewer side; and their new air-tight manhole cover with asbestos packing.

Mr. R. W. Tomlinson, of Leicester, has a useful stand, including an enamelled fireclay bath without casing, though the exterior is very absurdly painted and grained in imitation of oak and walnut panelling. The actual wooden boxing or casing has here evidently been given up with a pang, and consolation has been sought in the semblance of the thing that was.

There are, perhaps, other exhibits which would call for notice did space permit, but we have only aimed at giving a general idea of the Exhibition, which, we may repeat, will remain open until Saturday, October 19.

## OBITUARY.

*Mr. James Holloway.*—The death took place on the 23rd ult., of Mr. James Holloway, the well-known builder, which occurred at his residence, "Normanhurst," South Side, Clapham-common. Mr. Holloway, who has assisted in carrying out several important local works, died at the early age of thirty-eight. The remains were interred at Norwood Cemetery on Thursday, the 26th ult., the funeral being well attended.

**Registration of Plumbers.**—A mass meeting of plumbers in the Western District of London is announced to be held on Thursday, October 10, at 5.30, at the Town-hall, High-street, Kensington, for the purpose of considering the registration of plumbers promoted by the Worshipful Company of Plumbers.

# Illustrations.

## REREDOS, ELVETHAM CHURCH, HANTS.

THE whole of the work of this reredos is made of wood, all painted and gilded, with the exception of the centre and side panels, which are alabaster. These represent the Crucifixion and the Annunciation.

The woodwork and some painting was carried out by Mr. G. F. Wright, of Westminster, and the alabaster figures by Messrs. Farmer & Brindley. The rest of the painting was done by Mr. H. A. B. Smith, of Lewisham, and the architect, Mr. A. H. Skipworth.

The drawing from which the illustration is taken was exhibited in the Royal Academy of this year.

## THE HALL, BLACKHEATH, FRISTON, SUFFOLK.

THE illustration shows the grand hall at Blackheath, the Suffolk seat of Mr. T. F. C. V. and Lady Harriet Wentworth.

The house, which is entirely new, takes the place of a smaller edifice, originally on the site, of no particular architectural pretensions, and which was pulled down.

The site is a wild and beautiful spot, on the north bank of the Ald, well known to frequenters of Aldeburgh, and distant therefrom about three miles. The house is surrounded on three sides by pines—fine, well-grown trees, which afford splendid protection from the cold winds, and are the home of herons and other wild birds, and whose dark foliage is in beautiful harmony with the red brickwork of the house.

The mansion occupied over two years in building, and was completed and furnished last year.

Thin red bricks, made on the estate, are used for the facings, with cornices, string-courses, and other embellishments in Ancaster stone, and Broseley tile roofs.

The principal entrance is through a tower 65 ft. high, placed on the west side. This leads into the vestibule, 20 ft. square, and through wide swing doors into the hall. The greatest length of the hall is 60 ft. by a width of 32 ft., and from floor to ceiling of lantern is 35 ft. The woodwork is in the finest wainscot and pollard oak, with oak parquet floors, and the walls are hung with damask. The heating is by open fire-places and hot-water pipes, and this system is generally applied throughout the mansion. Around this hall all the principal rooms are grouped, the drawing-room to the south, the dining-room to the west, her ladyship's boudoir and other private rooms to the east, with gun, smoking, and business rooms and sportsmen's entrance to the north.

The dining-room is panelled in wainscot, 11 ft. high, with deep plaster frieze and cornice above, the dimensions being, 30 ft. long, 27 ft. greatest width, and 13 ft. 6 in. high.

The chimneypiece, likewise in oak, is carried up to the ceiling, whilst in the frieze of the wainscoting are sixty-five shields, with various quarterings of the Wentworth family. Similar quarterings are also inserted in the windows of the porch and vestibule, and are all painted in the proper colours.

The drawing-room is 56 ft. by 27 ft. greatest length and width, and the woodwork is of Havanna cedar, a three-centred open archway dividing the room into two parts.

The carvings throughout are of an elaborate and varied character, with the various crests and quarterings of the family freely introduced therein. They were all executed by Messrs. John Groom & Son, of Ipswich.

Messrs. J. & A. Brown, of Braintree, were the general contractors, Mr. W. H. Gibbs, of Saxmundham, executing the bricklaying and plastering, Mr. Alfred Wrinch, of Ipswich, fitted up the kitchen ranges, &c., and Mr. Barker, of Aldeburgh, did the electric bell hanging.

The whole of the work was carried out from my designs and full-size details, and under my supervision.

E. F. BISSHOPP.

## BINGHAM'S, MELCOMBE.

THIS is an old house in the centre of Dorsetshire, about four miles from Puddletown. The plan much resembles Athelhampton, and has a gateway facing the entrance-porch shown in the sketch. Not far off is Melcombe Horsey, formerly the residence of the Horsey family. The work at Melcombe Bingham should be compared with the porch at Montacute. This and the next-named illustration are from sketches made by Mr. R. W. Paul, during a "Pugin Scholarship" tour.

## ENTRANCE GATEWAY, FORD ABBEY.

THE gateway entrance-porch at Ford forms one of the chief features of Abbot Chard's work, 1521-44. To the left is the hall, and to the right the cloisters,—all the work of the same man. The cloisters are, however, now divided from the porch by a building added by Inigo Jones. There are two floors over the entrance (one only is shown in the sketch), and the tracery of the windows has been cut away in later times, and altered to suit the adjoining Renaissance work. The shields in panels of bay window contain the arms of Courtenay, De Redvers, and Baldwin de Brioniis. Over the entrance is a later shield with arms of Prideaux impaling Ivery.

## OLD COTTAGES, &c., ABOUT THE GOLDEN VALLEY, GLOUCESTERSHIRE.

THESE examples are taken from Chalford, a large village that hangs on the steep side of the hills, and is conspicuous from the railway approaching Brimscombe. The village is full of good "bits."

All the old buildings here are roofed with a local brown stone slate, which, though lacking in colour, gives a solid look to the work. In one instance this stone roof was, during my stay, supplanted by one of slate, with the result that the building was rendered comparatively common-place. The ridges and hips are made of freestone, and in many cases finials similar to those on No. 2 are used. The usual finish is, however, the little triple gablet. A marked feature is the use of string-courses, extending over two or more windows, and in some cases round one side of a house. No. 3 stands on the Thames and Severn Canal, which climbs the valley here at the rate of a lock and a mill to every few hundred yards. The red brick bridges, being of a respectable antiquity, are often very picturesque.

Bagpath House has a very characteristic tower-like ending, perhaps the most picturesque feature of this country.

The house at Brimscombe has the date 1648 on the chimney. The way the coping is worked into the chimney is worthy of notice.

RALPH NEVILL.

**Newchurch-in-Rossendale Board Schools.**—These schools were formally opened on Saturday by Mr. F. H. Freeland, B.A., her Majesty's Inspector of Schools for North-east Lancashire. The building is one story only in height, and has accommodation for about 300 children. The schools are designed on the class-room principle, the larger rooms being subdivided by means of revolving screens. The whole of the external walls are faced with local parpoints, the heating being by means of hot-water pipes. Boyle's exhaust cowls are used to assist the ventilation. The building was designed and carried out under the superintendence of Mr. Thomas W. Cubbon, architect, of Birkenhead, whose plans were selected from 139 submitted in public competition. Mr. A. E. Emmett acted as clerk of works.

…ct-named illustration are from …le by Mr. R. W. Paul, during a …rship" tour.

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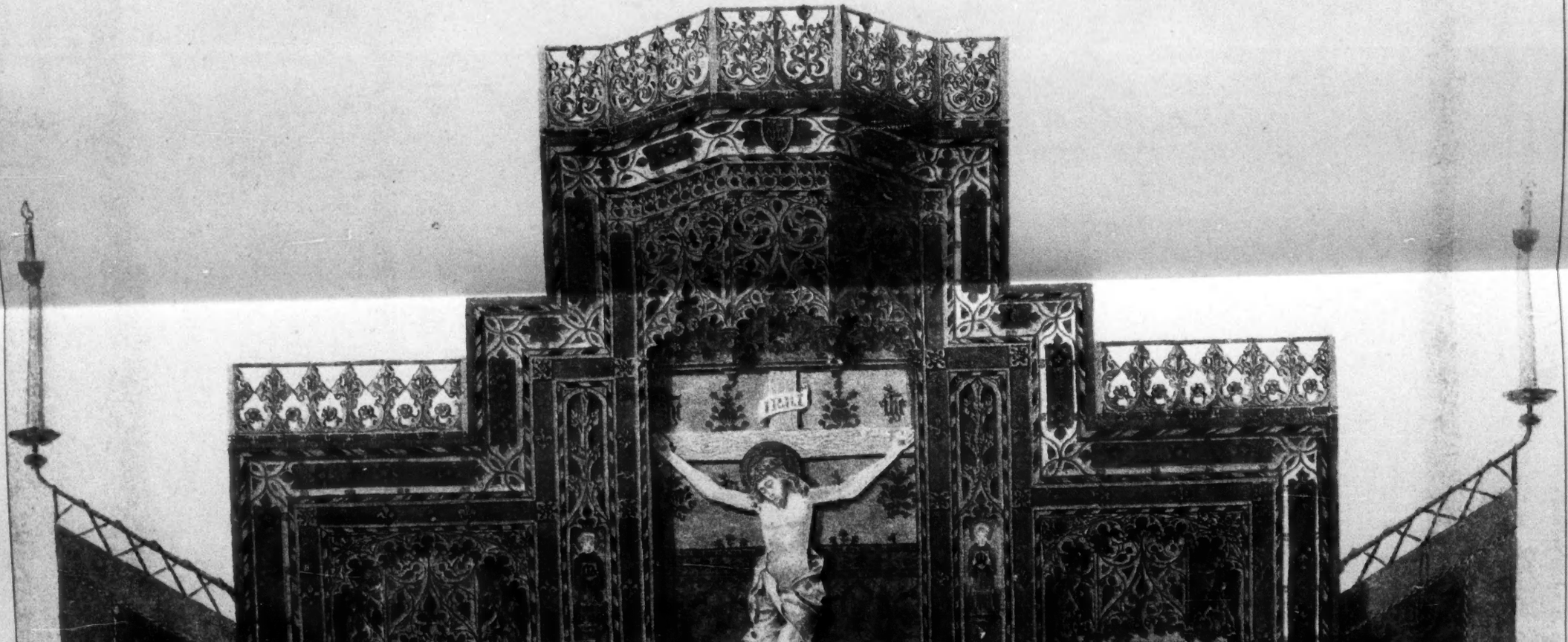
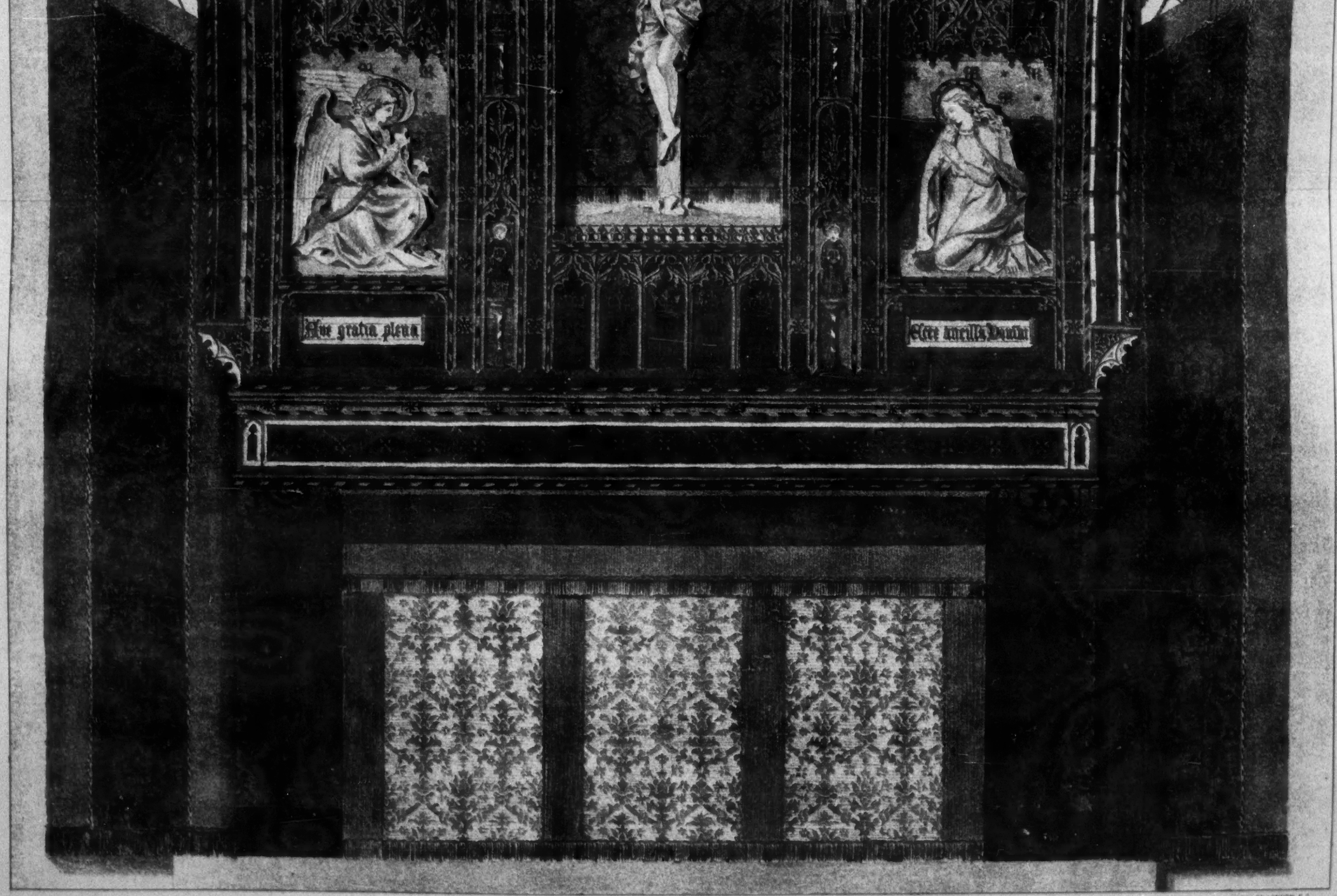
## REREDOS ERECTED IN ELVETHAM CH. HANTS.

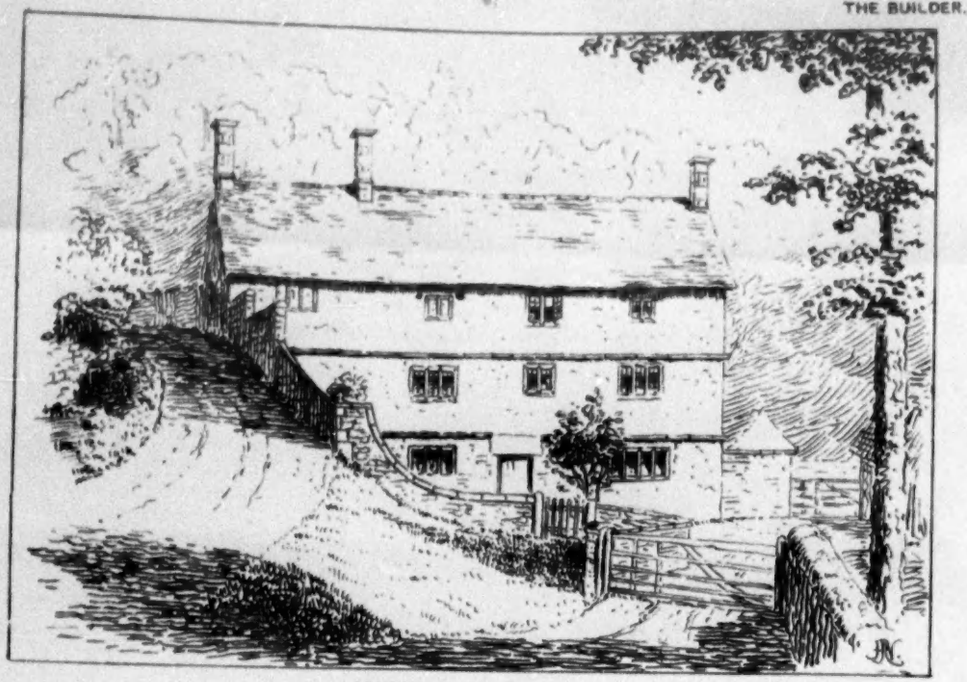




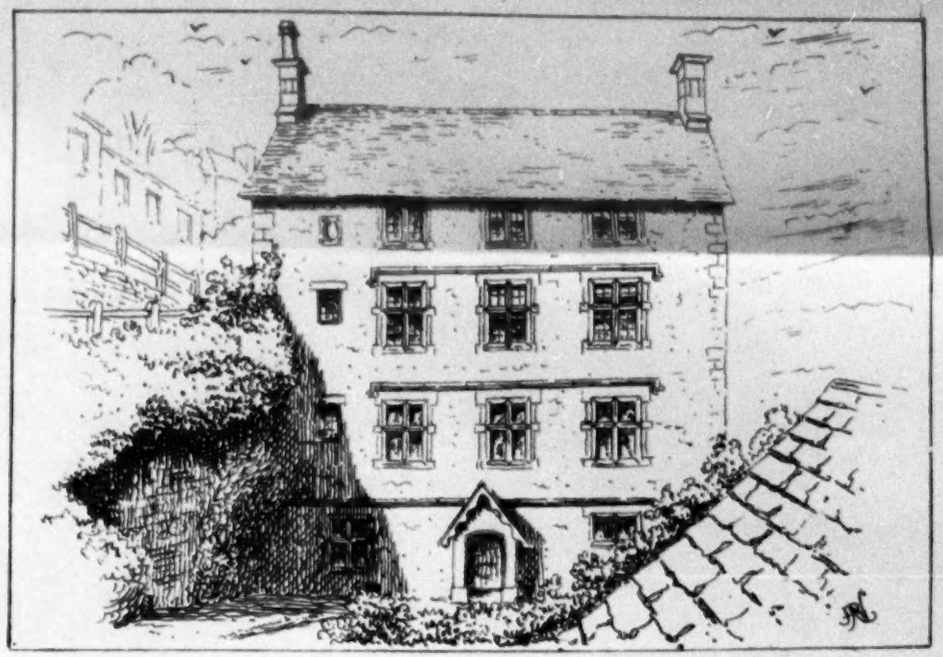

"The Photo," Sprague & Co., St. Martin's Lane, Cannon St., London, E.C.

REREDOS ERECTED IN ELVETHAM CHURCH, HANTS.—Mr. A. H. Skipworth, Architect.

THE HALL, BLACKHEATH, FRISTON, SUFFOLK.—Mr. E. F. Bisshopp, Architect.



ABNERS FARM, CHALFORD.



AT CHALFORD. No 1.

AT BROMSCOMBE.

COMPANY'S ARMS, CHALFORD. No 2.

PHOTO-LITHO. BRADDLE & Co LONDON

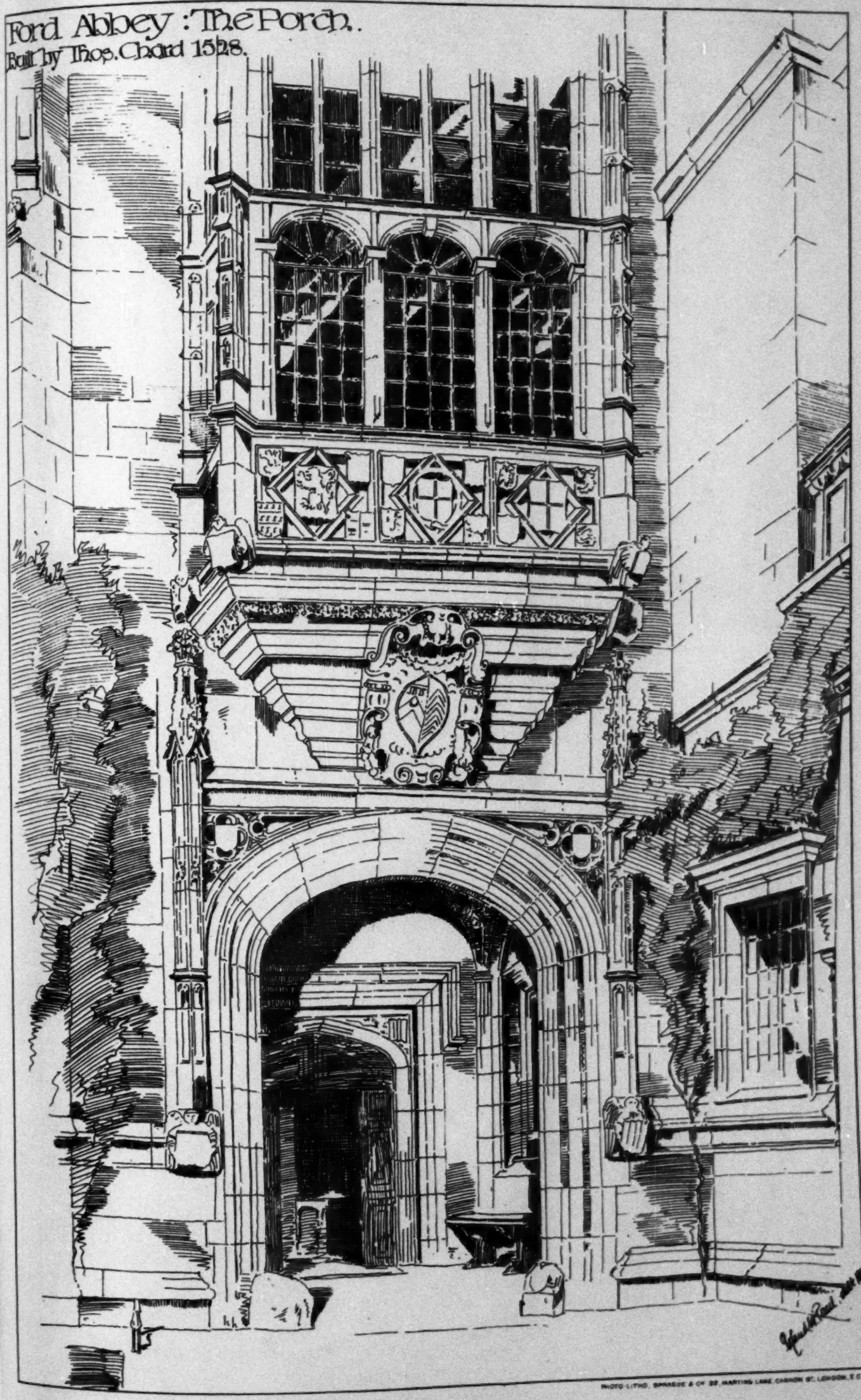
SKETCHES ABOUT THE GOLDEN VALLEY, GLOUCESTERSHIRE.—By Mr. Ralph Nevill, F.S.A.

Manor House at Melcombe Bingham, Dorsetshire — S.W. Front.

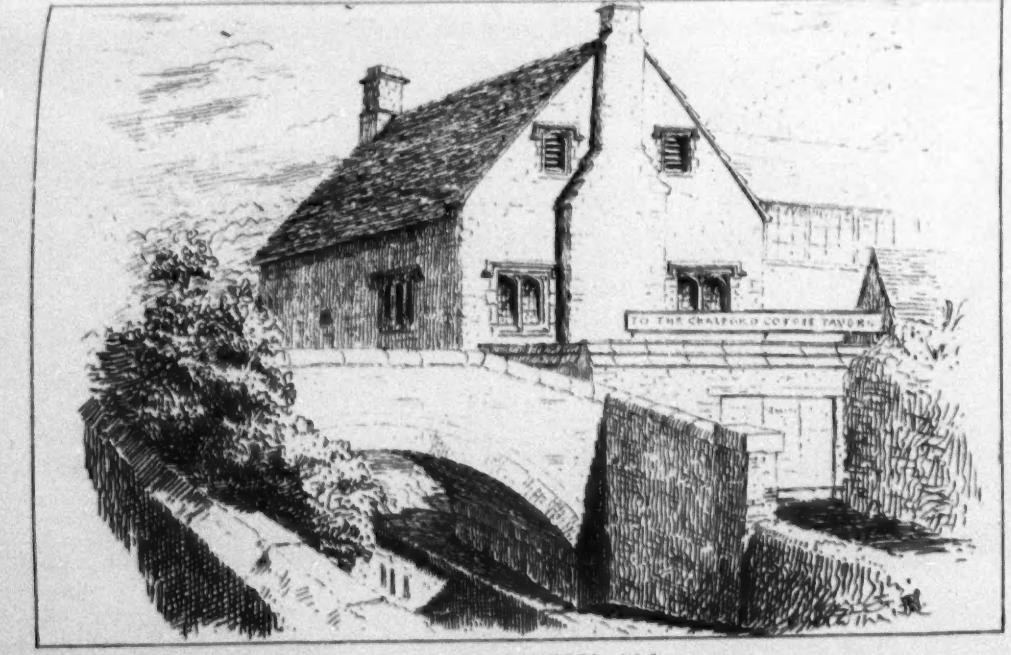
Bazel over Window. Ingham Stone. Shield with arms of Bingham.

SKETCHES DURING PUGIN TOUR, 1888.—By Mr. Roland W. Paul.

PHOTO-LITHO. SPRAGUE & Co. 82, MARTINS LANE, CANNON ST., LONDON, E.C.

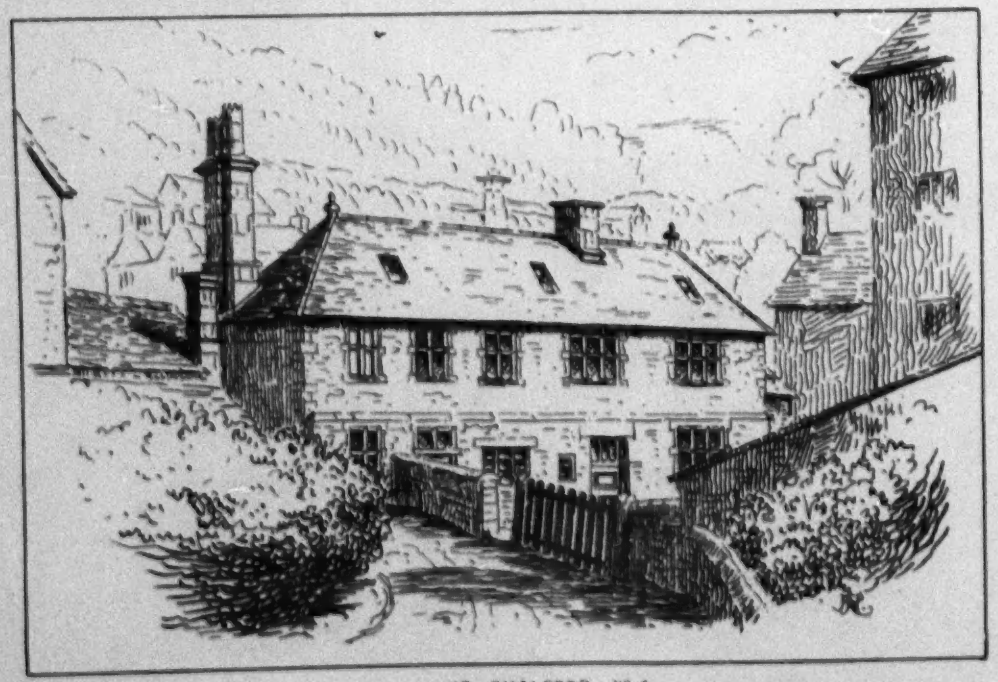



SKETCHES DURING PUGIN TOUR, 1888.—By Mr. Roland W. Paul.




AT CHALFORD. Nº 3

THE BUILDERS ARMS, CHALFORD. Nº 5



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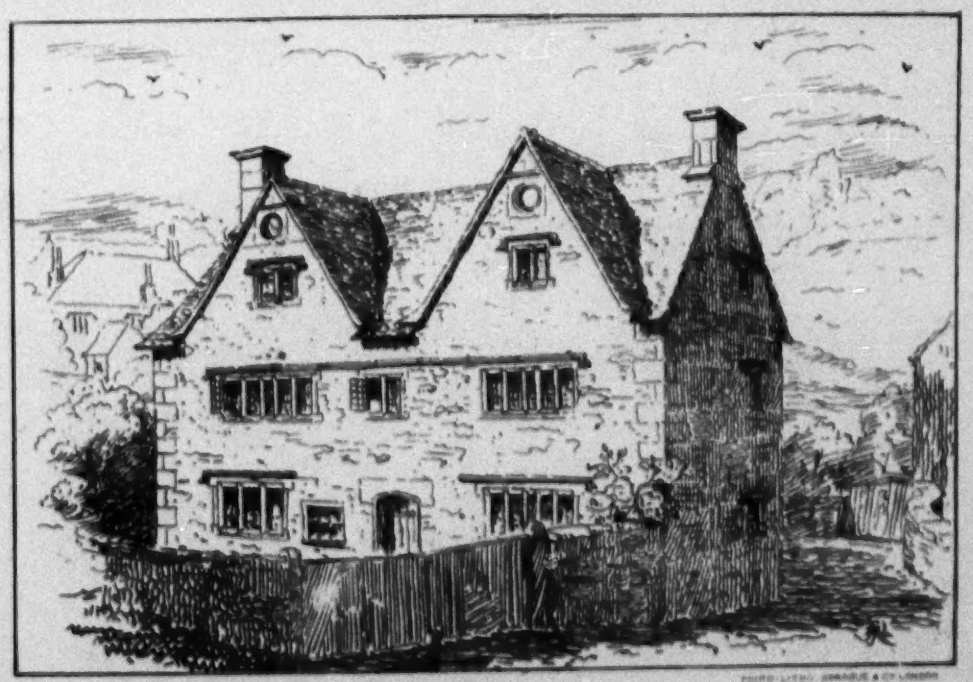

AT CHALFORD. Nº 6

SKETCHES ABOUT THE GOLDEN VALLEY, GLO'STERSHIRE.—By Mr. Ralph Nevill, F.S.A.

## THE ARCHITECTURAL ASSOCIATION.

The following is a syllabus of the meetings arranged by the Architectural Association for the Session 1889-90, so far as at present completed:—

Oct. 4, 1889.—Opening Conversazione.

Oct. 18.—Annual General Meeting. Address by the President (Mr. Leonard Stokes).

Nov. 1.—"The Treatment of Angles and Enclosing Lines," by Mr. F. T. Baggallay.

Nov. 15.—"The Paris Exhibition," by Mr. Banister F. Fletcher (Cates' Student).

Nov. 29.—"The Decoration of Churches," by Mr. E. Pridham Warren.

Dec. 13.—"Drawing," by Mr. Reginald T. Blomfield, M.A.

Jan. 3, 1890.—"Spires, Towers, and Domes," by Mr. Sydney B. Beale.

Jan. 17.—Discussion on the Progressive Examinations of the R.I.B.A., opened by Mr. Arthur Cates.

Jan. 31.—"Free Libraries," by Mr. E. W. Mountford.

Feb. 14.—"An Account of some Typical Greek Buildings," by Mr. R. Elsey Smith.

Feb. 28.—"Architecture in Oxfordshire," by Mr. W. A. Pite.

Mar. 14.—"Modernism in Art," by Mr. Henry Holiday.

Mar. 28.—"Hospitals," by Mr. Keith D. Young.

April 18.—Members' *Soirée*. Assemble at 8 p.m.

May 2.—Lecture by Mr. Alfred Gilbert, A.R.A. (Subject to be announced); Nomination of Officers.

May 16.—"The Travelling-Student's Notes," by Mr. A. E. Bartlett; Election of Officers.

## PARIS EXHIBITION AWARDS.

THE following list of awards to exhibitors at the Paris Exhibition is a selection from the general list, including, as far as we have been able to ascertain, all the awards for excellence in those departments of work in which our readers are specially interested.

The capital letters denote the degrees of distinction, as follows:—

G. P. = Grand Prize.
G. = Gold Medal.
S. = Silver Medal.
B. = Bronze Medal.
H. M. = Honourable Mention.

We give the awards in the Fine Arts Section in their entirety:—

| | | Awards. |
|---|---|---|
| Alma-Tadema, L., R.A., R.W.S. | Oil Painting | G.P. |
| Aumonier, J., R.I. | ,, | B. |
| Allan, R.W., A.R.W.S. | Water-colour | S. |
| Alma-Tadema, Miss A. | ,, | S. |
| Armstrong, Miss E. A. | ,, | B. |
| Aumonier, J., R.I. | ,, | G. |
| Anderson, R. R., F.R.I.B.A. | Architecture | S. |
| Bartlett, W. H. | Oil Painting | S. |
| Beadle, J. P. | ,, | B. |
| Burgess, J. B., R.A. | ,, | H. M. |
| Burne-Jones, E., A.R.A. | ,, | G. |
| Brewtnall, E. P., R.W.S. | Water-colour | B. |
| Brock, T., A.R.A. | Sculpture | B. |
| Browning, R. B. | ,, | B. |
| Birch, G. H., F.S.A., A.R.I.B.A. | Architecture | B. |
| Blanc, H. J. | ,, | B. |
| Burnett, J., Son, & Campbell, F.R.I.B.A. | ,, | B. |
| Calderon, P. H., R.A. | Oil Painting | B. |
| Carter, W. | ,, | H. M. |
| Charles, J. | ,, | S. |
| Charlton, J. | ,, | B. |
| Clausen, G. | ,, | S. |
| Cole, Vicat, A.R.A. | ,, | B. |
| Corbett, M. R. | ,, | B. |
| Crofts, E., A.R.A. | ,, | B. |
| Clausen G. | Water-colour | S. |
| Collier, T., R.I. | ,, | S. |
| Cotman, F. G., R.I. | ,, | S. |
| Crane, W., R.I. | Drawing | S. |
| Campbell, Douglas, & Sellars | Architecture | B. |
| Collcutt, T. E., F.R.I.B.A. | ,, | G. P. |
| Douglas & Fordham | ,, | G. |
| East, Alfred, R.I. | Oil Painting | H. M. |
| East, Alfred, R.I. | Water-colour | G. |
| Emslie, A. E., A.R.W.S. | ,, | B. |
| Emerson, W., F.R.I.B.A. | Architecture | S. |
| Fildes, Luke, R.A. | Oil Painting | S. |
| Fisher, Mark, R.I. | ,, | B. |
| Forbes, Stanhope A. | ,, | G. |
| Fulleylove, J., R.I. | Water-colour | B. |
| Ford, E. Onslow, A.R.A. | Sculpture | S. |
| Goodall, F., R.A. | Oil Painting | B. |
| Goodall, T. F. | ,, | H. M. |
| Gow, A. C., A.R.A., R.I. | ,, | S. |
| Gregory, E. J., A.R.A., R.I. | ,, | S. |
| Gregory, E. J., A.R.A., R.I. | Water-colour | G. |
| Gilbert, A., A.R.A. | Sculpture | G. P. |
| Greenaway, Miss K. | Drawing | B. |
| Goddard, J., & Paget, A. H., F.R.I.B.A. | Architecture | S. |
| Hacker, A. | Oil Painting | B. |
| Hallswelle, K., R.I., A.R.S.A. | ,, | H. M. |
| Henry, C. Napier, R.I. | ,, | H. M. |
| Herkomer, H., R.A., R.I. | ,, | G. |
| Hook, J. C., R.A. | ,, | G. |
| Hunter, Colin, A.R.A., R.I. | ,, | S. |
| Hague, Anderson, R.I. | Water-colour | S. |
| Hartley, A. | ,, | B. |
| Hine, H. G., R.I. | ,, | B. |
| Holloway, C. E., R.I. | ,, | S. |
| Hébert, P. | Sculpture | B. |
| Haden, F. Seymour, P. of R.S.P.E. | Etching | G. P. |
| Johnson, C. E., R.I. | Oil Painting | B. |
| Jeffreys, Miss Edith Gwyn | Sculpture | H. M. |
| Kennington, T. B. | Oil Painting | B. |
| Knight, Joseph, R.I. | ,, | B. |
| Knight, J. Buxton | ,, | B. |
| King, Yeend, R.I. | Water-colour | B. |
| Keene, Charles | Drawing | G. |
| Lavery, J. | Oil Painting | B. |
| Leader, B. W., A.R.A. | ,, | G. |
| Leighton, Sir Frederick, Bart., P.R.A. | ,, | G. |
| Leslie, G. D., R.A. | ,, | B. |
| Langley, Walter, R.I. | Water-colour | G. |
| Linton, Sir James D., P.R.I. | ,, | S. |
| Lee, T. Stirling | Sculpture | B. |
| Leighton, Sir Frederick, Bart., P.R.A. | ,, | G. P. |
| Lowenstam, L. | Etching | S. |
| Macbeth, R. W., A.R.A., R.I. | Oil Painting | B. |
| Merritt, Mrs. Anna Lea | ,, | H. M. |
| Millet, F. D. | ,, | S. |
| Montalba, Miss Clara, A.R.W.S. | ,, | H. M. |
| Moore, Henry, A.R.A., R.W.S. | ,, | G. P. |
| Morris, P. R., A.R.A. | ,, | B. |
| Murray, D., A.R.W.S. | ,, | B. |
| Marshall, Herbert, R.W.S. | Water-colour | S. |
| Mottram, C. S. | ,, | B. |
| Maclean, T. Nelson | Sculpture | H. M. |
| Mullins, E. Roscoe | ,, | S. |
| Macbeth, R. W., A.R.A., R.I. | Etching | G. |
| North, J. W., R.W.S. | Water-colour | S. |
| Orchardson, W. Q., R.A. | Oil Painting | G. |
| Parsons, Alfred, R.I. | ,, | S. |
| Parton, E. | ,, | H. M. |
| Prinsep, V. C., A.R.A. | ,, | B. |
| Parsons, Alfred, R.I. | Water-colour | G. |
| Pyne, Thos., R.I. | ,, | B. |
| Pegram, H. | Sculpture | B. |
| Rae, Miss Henriette | Oil Painting | H. M. |
| Rattray, Wellwood | ,, | H. M. |
| Reid, J. R. | ,, | G. |
| Rivière, Briton, R.A. | ,, | B. |
| Sant, James, R.A. | ,, | B. |
| Shannon, J. J. | ,, | G. |
| Smythe, Lionel P., R.I. | ,, | B. |
| Solomon, S. J. | ,, | B. |
| Starr, Sidney | ,, | B. |
| Stokes, Adrian | ,, | B. |
| Stone, Marcus, R.A. | ,, | S. |
| Swan, J. M. | ,, | S. |
| Severn, Arthur, R.I. | Water-colour | H. M. |
| Smythe, Lionel P., R.I. | ,, | H. M. |
| Sambourne, Linley | Drawing | B. |
| Short, Frank | Engraving | G. |
| Strang, W. | Etching | S. |
| Scott, J. O., F.S.A., F.R.I.B.A. | Architecture | B. |
| Shaw, R. N., R.A. | ,, | G. P. |
| Stokes, L., A.R.I.B.A. | ,, | S. |
| Waterhouse, J. W., A.R.A., R.I. | Oil Painting | S. |
| Whistler, J. McNeil | ,, | G. |
| Woods, H., A.R.A. | ,, | B. |
| Wyllie, Chas. W. | ,, | B. |
| Waite, R. Thorne, R.W.S. | Water-colour | B. |
| Weedon, A. W., R.I. | ,, | B. |
| Wimperis, E. M., R.I. | ,, | B. |
| Wollen, W. B., R.I. | ,, | S. |
| Wyllie, C. W. | ,, | B. |
| Wyllie, W. L., A.R.A., R.I. | ,, | G. |
| Wyllie, W. L., A.R.A., R.I. | Etching | B. |
| Webb, A., & Bell, J., F.R.I.B.A. | Architecture | G. |
| Young, W. | ,, | S. |

The remainder of the list is selected from the awards in a number of various sections; the number placed before the capital letter refers to the section. The following are the definitions of the sections we have selected from:—

6. Education of Children. Primary Instruction. Instruction of Adults.
15. Instruments of Precision.
17. Cheap and High-class Furniture.
18. Upholsterers' and Decorators' Work.
19. Crystal, Glass, and Stained Glass.
20. Pottery.
21. Carpets, Tapestry, and other Stuffs for Furniture.
22. Paperhangings.
25. Bronzes, various Art-castings, Iron-work, and Repoussé-work.
27. Apparatus and Processes for Heating: Apparatus and Processes for Lighting other than Electric.
41. Products of Mining and Metallurgy.
43. Products of the Cultivation of Forests and of the Trades appertaining thereto.
48. Apparatus and Processes of the Arts of Mining and Metallurgy.
49. Implements and Processes used in the Cultivation of Fields and Forests.
53. Machines and Apparatus in general.
53. Machine Tools.
57. Apparatus and Processes used in the Manufacture of Furniture and Objects for Dwellings.
59. Machines, Instruments, and Processes used in various Works.
61. Railway Apparatus.
62. Electrical Apparatus and Processes.
63. Apparatus and Processes of Civil Engineering, Public Works, and Architecture.
64. Hygiene and Sanitation.
65. Apparatus for Navigation and Life-saving.

The following are the principal awards in the above-named classes:—

| | | Awards. |
|---|---|---|
| Acme Electric Works | 62 | H. M. |
| Adderley & Co., W. A. | 20 | S. |
| Addis & Sons, James B. | 41 | B. |
| Alldays & Onions, Limited | 48 | S. |
| Allen & Co., N.B. | 41 | B. |
| ,, ,, | 62 | B. |
| Alliance Aluminium Company, Limited | 41 | G. |
| Aluminium Company | 41 | G. |
| Anagypta Company | 22 | H. M. |
| Anderson & Son, Limited, D. | 62 | B. |
| Anglo-American Tin Stamping Co., Ld. | 41 | S. |
| Angus & Co., George, Ld. | 52 | S. |
| Appleby Brothers, Ld. | 62 | S. |
| Armitage, George Faulkner | 17 | G. |
| Armstrong, Mitchell, & Co., Ld., Sir W. G. | 65 | G. |
| Automatic Electrical Corporation, Ld. | 62 | B. |
| Aveling & Porter | 63 | G. |
| Avery, W. & T. | 15 | S. |
| ,, ,, | 53 | B. |
| Aylmer, R. | 62 | B. |
| Banner Sanitation Co. | 64 | B. |
| Bannister & Annett | 61 | B. |
| Barford & Perkins | 49 | H. M. |
| Barnardo, T. J. | 64 | G. |
| Barry, Ostlere, & Co., John | 21 | S. |
| Bartleet & Sons, Wm. | 41 | G. |
| Blackman Ventilating Co., Ld. | 53 | B. |
| Bodley, Edwin J. D. | 20 | B. |
| Bradford & Co., Thomas | 51 | S. |
| ,, ,, | 44 | G. |
| British Stone and Marble Co. | 63 | B. |
| Brooke & Sons, Edward | 51 | B. |
| Brownfield & Sons, William | 20 | G. |
| Brown-Westhead, Moore, & Co., T. C. | 20 | G. P. |
| Burys & Co., Lim. | 41 | G. |
| Cantrell & Cochrane | 64 | B. |
| Canty, Miss Lottie | 18 | H. M. |
| Chubb & Sons' Lock and Safe Co., Lim. | 41 | S. |
| ,, ,, ,, ,, | 62 | B. |
| ,, ,, ,, ,, | 63 | G. |
| ,, ,, ,, ,, | 65 | B. |
| Clark, Muirhead & Co., Lim., Latimer | 63 | G. |
| Clarke, Samuel | 27 | B. |
| Clarkson, Alexander | 15 | S. |
| Clayton (John R.) & Bell (Alfred) | 19 | G. |
| Cocker Bros., Lim. | 41 | G. |
| Consett Iron Co., Lim. | 41 | G. P. |
| Continental Diamond Rock Boring Co., Lim. | 41 | H. M. |
| Continental Oxygen Co., Lim. | 64 | H. M. |
| Cooke Brothers | 41 | B. |
| Copeland & Sons, W. T. | 20 | G. P. |
| Corticine Floor Covering Co., Lim. | 21 | S. |
| Credenda Seamless Steel Tube Co. | 41 | S. |
| Crompton & Co., Lim. | 62 | G. |
| Crossley Brothers, Lim. | 52 | G. |
| Crossley & Sons, Lim., John | 21 | G. P. |
| Daniell & Sons, A. B. | 20 | S. |
| Davey, Paxman & Co. | 46 | G. |
| Davis & Timmins, Lim. | 41 | B. |
| ,, ,, | 63 | B. |
| Doulton & Co. | 20 | G. P. |
| ,, ,, | 27 | B. |
| ,, ,, | 63 | G. |
| ,, ,, | 64 | G. |
| Ducker Portable House Co., Lim. | 63 | B. |
| Eastern Telegraph Co., Lim. | 62 | G. |
| Ebbw Vale Steel, Iron, and Coal Co. | 41 | G. |
| Edgington, Lim., Benjamin | 39 | S. |
| Edwards & Roberts | 17 | S. |
| Electrical Power Storage Co., Lim. | 61 | S. |
| Elliott Brothers | 62 | G. P. |
| Elliott Samuel | 63 | S. |
| Farmer & Brindley | 63 | S. |
| Farmiloe & Sons, George | 63 | S. |
| Farnley Iron Co., Lim. | 41 | G. |
| ,, ,, | 63 | G. |
| Fielding & Platt | 53 | S. |
| Fisher's Patent Wall Hanging Syndicate, Lim. | 23 | H. M. |
| Fletcher & Co., Thomas | 27 | G. |
| Forester & Sons, Thomas | 20 | B. |
| Fowler & Co., Lim., John | 63 | G. |
| Francis & Co., Lim. | 63 | G. |
| Francis, Son, & Co., C. | 63 | S. |
| Gale & Sons, George | 17 | B. |
| Galloway & Sons, Lim., W. & J. | 52 | G. P. |
| Gandy Belt Manufacturing Co., Lim. | 53 | S. |
| Gardner & Co., Starkie | 25 | S. |
| Garrard & Son, W. H. | 53 | H. M. |
| Gilchrist, Percy C. | 48 | G. P. |
| Giles & Co., Frank | 17 | S. |
| Gjers, Mills, & Co. | 41 | S. |
| ,, ,, | 48 | G. |
| Glamorgan Coal Co., Lim. | 41 | G. |
| Glanrafon Slate Quarry Co. | 63 | S. |
| Glanvill & Co., George | 21 | B. |
| Glenboig Union Fire Clay Co., Lim. | 41 | G. |
| ,, ,, ,, ,, | 63 | G. |
| Globe Electrical and Engineering Co. | 62 | H. M. |
| Goode & Co., Thomas | 20 | S. |
| Graham & Biddle | 17 | G. |
| Greenwood & Batley, Lim. | 53 | G. |
| Griffiths Bros. & Co. | 45 | B. |
| Grover & Co., Lim. | 61 | H. M. |
| Guest, L. & H. | 41 | G. |
| Gwaun Cae Gurwen Colliery Co., Lim. | 41 | G. |
| Hanley & Co., Lim., Felix | 41 | B. |
| Hamblet, Joseph | 63 | S. |
| Hardy Patent Pick Co., Lim. | 48 | G. |
| Haslam Fire Extinguisher Co. | 65 | H. M. |
| Haynes & Co., George | 27 | S. |
| Heilwell, T. W. | 63 | B. |
| Helme & Co., James | 21 | B. |
| Henley's Telegraph Works Co., Lim., W. T. | 62 | S. |
| Herring Bros. | 41 | B. |
| ,, ,, | 63 | B. |
| Hindley, E. S. | 52 | H. M. |
| Hinks & Sons, Lim., James | 27 | S. |
| Hollyer, Frederick | 12 | S. |
| House Sanitation Co. | 64 | H. M. |
| Howatson & Co., A. | 63 | B. |
| Hulse & Co. | 53 | S. |
| Humphreys, James Charlton | 63 | G. |
| Hunter & English | 62 | B. |
| ,, ,, | 63 | S. |
| ,, ,, | 65 | S. |
| Huntsman, B. | 41 | S. |
| Huxham & Brown | 51 | B. |
| Hydraulic Engineering Co., Lim. | 53 | G. |
| ,, ,, | 53 | G. |
| Incandescent Gas-Light Co., Lim. | 27 | S. |
| Indian Collective Exhibit of Pottery | 20 | H. M. |
| Indian Pavilion | 63 | G. |
| Isler & Co. | 48 | B. |
| Jackson & Sons, George | 18 | G. |
| Jeffrey & Co. | 18 | B. |
| ,, ,, | 22 | G. |
| Jennings, George | 17 | S. |
| ,, ,, | 64 | G. |
| Jessop & Sons, Lim., William | 41 | G. |
| Jeyes' Sanitary Compounds Co., Lim. | 45 | H. M. |
| Johnson, Matthey, & Co. | 41 | G. P. |
| Johnson & Co., John | 41 | H. M. |

| | | Awards. |
|---|---|---|
| Kenrick & Sons, Archibald | 41 | S. |
| Kent & Sons, G. B. | 29 | G. |
| Kirkaldy, Lim., John | 52 | S. |
| Knap & Co., Conrad | 52 | S. |
| Laycock, W. S. | 61 | H. M. |
| Lechertier, Barbe, & Co. | 10 | B. |
| Leeds Forge Co., Lim. | 41 | G. |
| Leeds L. W. Patent Floor Warming Stove Co., Lim. | 27 | B. |
| Lewis & Lewis | 59 | B. |
| London and North-Western Railway Co., Lim. | 61 | G. P. |
| London, Brighton, and South Coast Railway Co. | 61 | G. |
| " " " | 63 | S. |
| London, Chatham, & Dover Railway Co. | 65 | N. |
| London Water Meter Co., Lim. | 52 | B. |
| " " " | 63 | S. |
| Londonderry, Marquis of | 41 | G. |
| Lowood & Co., J. Grayson | 41 | G. |
| " " " | 48 | S. |
| " " " | 63 | G. |
| Lucigen Light Co. | 27 | S. |
| Macintyre & Co., James | 20 | H. M. |
| McNeil & Co. | 63 | B. |
| Macniven & Cameron | 10 | S. |
| Maignen's Filtre Rapide and Anti-Calcaire Co., Lim. | 52 | H. M. |
| Massey, B. & S. | 48 | S. |
| Maw & Co., Lim. | 20 | G. |
| Midland Railway Co. | 61 | G. P. |
| Mills, James (Executors of) | 53 | H. M. |
| Milward & Sons, Henry | 41 | G. |
| Mitcham Linoleum and Floor Cloth Co., Lim. | 21 | B. |
| Model & Co. | 17 | H. M. |
| Moncrieff, John | 19 | S. |
| Morgan Gold-mining Co., Lim. | 41 | S. |
| Musgrave & Co., Lim. | 27 | G. |
| Nairn & Co., Michael | 21 | S. |
| Neilson & Co. | 61 | G. |
| Neilson, Shaw, & Macgregor | 21 | H. M. |
| Nicholson, J. O. | 21 | B. |
| North London Railway Co. | 61 | H. M. |
| Oakeley Slate Quarries Co., Lim. | 41 | G. |
| " " " | 63 | G. |
| O'Brien & Co. | 64 | H. M. |
| Openshaw & Co. | 41 | B. |
| Oriental Leather & Leatherette Co., Lim. | 22 | B. |
| Palmer's Shipbuilding & Iron Co., Lim. | 41 | G. |
| Paris Earthenware, Crystal, and Hardware Co., Lim. | 27 | S. |
| " " " | 63 | B. |
| " " " | 64 | H. M. |
| Parkinson, Joseph | 53 | B. |
| Patent Nut and Bolt Co., Lim. | 41 | G. |
| " " " | 61 | S. |
| Paterson & Cooper | 62 | S. |
| Pen yr Orsedd Slate Quarry Co., Lim. | 41 | B. |
| " " " | 63 | S. |
| Peyton & Peyton | 17 | S. |
| Pillischer, J. | 15 | G. |
| Powell, Bishop, & Stonier | 20 | S. |
| Procter & Co. | 17 | B. |
| " " " | 25 | B. |
| Quirk, Barton & Co. | 63 | S. |
| Reynolds & Co., F. W. | 49 | S. |
| " " " | 57 | B. |
| Ridsdale's Railway Lamp and Lighting Co., Lim. | 61 | B. |
| Robins, E. C. | 6 | G. |
| Robinson & Son, Lim., Thomas | 57 | G. |
| Rose & Dobson | 19 | B. |
| Rylands & Sons, Lim. | 21 | B. |
| School Board for Birmingham | 6 | G. |
| School Board for London | 6 | G. P. |
| Selig, Sonnenthal, & Co. | 63 | S. |
| " " " | 66 | H. M. |
| Simplex Railway Patents (F) Syndicate | 61 | H. M. |
| Skelsey, George H. | 63 | S. |
| Society "Sunbeam" | 62 | S. |
| South Derwent Colliery | 41 | S. |
| Sporton & Co., Henry | 52 | H. M. |
| " " " | 63 | B. |
| South-Eastern Railway Co. | 61 | G. |
| Storey Brothers & Co. | 21 | S. |
| Stothert & Pitt, Lim. | 63 | G. |
| Sugg & Co., Lim., William | 27 | G. |
| Tharsis Sulphur and Copper Co. | 41 | G. P. |
| " " " | 48 | G. P. |
| Thomas & Sons, S. | 41 | H. M. |
| Thwaites Brothers | 48 | B. |
| Timmis, Illius A. | 61 | S. |
| Tooth & Co. | 20 | H. M. |
| Treloar & Sons | 21 | H. M. |
| Tubular Lock Syndicate, Lim. | 63 | G. |
| Turner & Sons, R. | 41 | S. |
| Unbreakable Pulley Co. | 52 | H. M. |
| United Asbestos Co., Lim. | 52 | B. |
| Unwin, Fisher | 9 | B. |
| Vacuum Brake Co. | 61 | G. |
| Votty & Bowydd Slate Quarries Co., Limited | 41 | S. |
| " " " | 63 | S. |
| Vulcan Fire Brick Co., Lim. | 51 | B. |
| Waddell & Sons, John | 41 | B. |
| Wadsworth & Son, Henry | 63 | S. |
| Watts, Ward, & Co. | 41 | G. |
| Webb & Sons, Lim., Thomas | 19 | G. P. |
| " " " | 27 | S. |
| Westinghouse Brake Co., Lim. | 61 | G. |
| Wiggin & Co., Henry | 41 | S. |
| Wilson & Sons, Charles | 27 | S. |
| Wilson, Lawrence | 17 | B. |
| Woodfield & Sons, W. | 41 | S. |
| Woolliams & Co., Wm. | 22 | G. |
| Wright & Sons, Peter | 53 | B. |
| Wylie & Lochhead, Lim. | 22 | S. |
| Yates, Haywood, & Co. | 27 | S. |
| SOCIAL ECONOMY SECTION. | | |
| City and Guilds of London Institute | | G. P. |
| Commissioners of Sewers of London | | G. |
| Improved Industrial Dwellings Co. (Sir S. Waterlow) | | G. P. |
| Metropolitan Asylums Board | | G. |
| Metropolitan Public Gardens Association | | G. |
| People's Palace | | G. |
| School Board for London | | G. P. |
| Stockport Technical School | | S. |
| Working Men's Club and Institute | | G. P. |

## THE AMINES PROCESS OF SEWAGE TREATMENT AT WIMBLEDON.

SIR,—In reference to the article in your issue of the 21st ult.,* we note your acknowledgment that the Amines process has good points, and, in reference to those points which you consider doubtful, we submit the following statements of fact, which we think meet all the objections that have been raised:—

1. We do not claim to "utilise the disinfectant properties of a *mixture* of trimethylamine and lime," but that by the action of the latter on the former a disinfectant of extraordinary power is evolved.

2. Seventy grains of lime and three of brine is not the amount required for every gallon of sewage. These quantities are the maxima used in a first treatment. By using the first sludge as precipitant (with a slight addition of fresh reagent), and by making a third and a fourth repetition treatment in this way, the average quantities actually required at Wimbledon were found to be about forty-seven grains of lime and three of brine. The variation of quantities for sewage containing manufacturing refuse would be inconsiderable, as experiments elsewhere have shown.

3. As to the odour of the effluent, Dr. Bell (of Somerset House) called it "briny," and Dr. W. R. Smith "saltish," and no analyst has ever yet compared it to anything offensive.

4. The tests to which the sludge were subjected, so far from being imperfect because limited, were, in point of fact, conclusive, because the severest possible. A thousand tons would not act differently from ten tons, and the conditions of temperature could not be more favourable to putrefaction for the next six months than they were between August 7 and September 18 (the period of the test).

5. The alkalinity of the effluent (as shown by analysis) is actually below that allowed by the Rivers Pollution Bill (1885). This disposes of the apprehensions as to its effect on fish life. As for crops, we claim beneficial effects, and the present operations at Wimbledon will, we are confident, settle that point very shortly.

6. The brine supply can be shown to be abundant for all practical purposes, unless, indeed, all the 500 sewered towns of England should adopt the process before the next fishing season—a contingency our past experience hardly warrants us in expecting. Nor can trimethylamine be obtained from herring-brine only, as a look at Watts's dictionary will show.

7. No other effluent contains an appreciably less proportion of nitrogenous organic matter than the Amines, and other effluents are not sterile.

8. The effluent has proved itself safe under prolonged air-exposure and varying temperature, not only in the severest laboratory tests, made with sewages of widely different kinds, but by prolonged exposure in the tanks. The very dilution of a *sterile* effluent renders it an unfertile soil for organisms from the river; but, besides being sterile, the Amines effluent enters the river charged with a powerful antiseptic, which is only diluted *pari passu* with the organic matter.

E. H. ELLICE CLARK,
HUGO WOLLHEIM.

101, *Leadenhall-street, E.C.*,
September 30, 1889.

* Page 206, *ante*.

## CONCRETE FLOORS.

SIR,—I am, I fear, as far as ever from acknowledging the truth of Mr. Caws's formula that "the strength of slabs is inverse to their breadth or diameter, and is as the square of their thickness." I still maintain that the rule ought to be "the strength of square slabs per square foot is as the square of their thickness, and inversely as their *area*." Mr. Caws does not in any way attempt to disprove the correctness of Professor Unwin's rule, but merely argues that it errs on the side of too much strength, if it be applied to iron structures. This can easily be remedied by employing a greater factor of safety, or a suitable constant based on actual experiment, as, in fact, was done by Mr. Caws when he applied the formula to concrete slabs. If, by using this constant, he found that the strength of slabs was underestimated, I venture to suggest that it was the constant that ought to have been altered, and not the rule. I notice that he is somewhat loth to declare the absolute inaccuracy of the rule, but considers it to be "probably at fault." What is necessary for Mr. Caws to show is, that the formula gives *unequal results*, that it allows too much strength to small slabs and too little to large ones, or *vice-versâ*. This, however, he does not attempt.

In my letter, published on the 7th instant, I showed that the two examples adopted by Mr. Caws as of equal strength, are, according to Professor Unwin, unequal; but as Mr. Caws declines to pin his faith to the Professor, I must try to prove my contention some other way. Let us take again the same examples, and test them by a method derived from the last letter of Mr. Caws (the first paragraph on page 211), namely, "the attacking stress-causing force" on a square slab is (I merely substitute general terms for the particular example there given) $\frac{\text{weight}}{4} + \frac{\text{length}}{6}$. Given, then, the two slabs as before (1) 1 ft. by 1 ft. carrying 400 lb., and (2) 10 ft. by 10 ft., carrying 40 lb. per square foot,—that is, a total load of 4,000 lb. In (1) "the attacking stress-causing force" is

$$\frac{400}{4} \times \frac{1}{6} = \frac{400}{24} = 16{\cdot}6 \text{ lb.}$$

In (2) it is $\frac{4000}{4} \times \frac{10}{6} = \frac{40.000}{24} = 1{,}666{\cdot}6$ lb.

Here I must anticipate something, of which I hope to speak more fully hereafter. In (1) the force of 16·6 lb. acts on the side of a square 1 ft. in length, and is, therefore, 16·6 lb. per lineal ft. of support; in (2) the force acts on the side of a square 10 ft. in length, and is, therefore, $\frac{1666{\cdot}6}{10} = 166{\cdot}6$ lb. per lineal ft. of support. If you take a slab 100 ft. square, the strain per lineal ft. of support will appear to be 1666·6 lb.; and so on, in increasing error. And yet Mr. Caws maintains that all these slabs are equally safe.

Now test by this method also the rule which is, in my opinion, the correct one,—that the strength of slabs is inversely as their *area*, &c. We found (p. 178) from this rule that "all square slabs, of whatever area, if of the same thickness, will carry the same distributed load." We have, then, two examples: (A) 1 ft. by 1 ft. carrying 400 lbs., and (B) 10 ft. by 10 ft. carrying 4 lbs. per square foot,—that is, a total load likewise of 400 lbs.

In (A) "the attacking stress-causing force" is

$$\frac{400}{4} \times \frac{1}{6} = \frac{400}{24} = 16{\cdot}6.$$

In (B) it is $\frac{400}{4} \times \frac{10}{6} = \frac{4000}{24} = 166{\cdot}6$.

Then in (A) the strain per lineal foot of support is 16·6 lbs., and in (B) $\frac{166{\cdot}6}{10} = 16{\cdot}6$. A slab 100 ft. square, carrying 400 lbs., will give the same result. And so on, the strain on the slab being in all cases equal.

To me this is a convincing proof, founded, too, on Mr. Caws's own statements, that his original formula is erroneous, and that the Professor is, after all, quite right.

Mr. Caws invites me (p. 210) to test his theory of slabs for myself, and if I find any flaw in it, to correct him. I am really sorry that I must again declare myself at issue with him. This time it is on the question of the strength of square and rectangular slabs. This reasoning leads him to his startling conclusion—made more conspicuous by the italics in which he prints it—"*the more nearly square the slabs, the stronger they are.*" This is said, of course, of slabs of the same area. One sees at a glance that the statement is wrong, but intuition is not enough; we must have proof.

Take a square slab 10 ft. by 10 ft., and a rectangular slab 20 ft. by 5 ft., each, therefore, containing 100 square feet. According to Mr. Caws the former ought to be considerably stronger than the latter. We differ. To find the "stress-causing" force on the square slab, Mr. Caws would divide the square by diagonals into four equal triangles, compound the forces on each into one resultant force, acting through its centre of gravity, and multiply this by the distance of the centre of gravity from the support; the product would be the actual strain on the edge of the slab. Here we become cognisant of an omission, which Mr. Caws perhaps thought unimportant in the consideration of square slabs, but which, omitted in considering rectangular slabs, is *one* chief reason of his arrival at the startling conclusion quoted above. He has compounded the vertical downward forces into one resultant; he forgets to resolve the product of the resultant and leverage into the

resisting forces along the whole length of the supported edges.

For my own part I prefer to look at the matter in a slightly different light. In fig. 1,

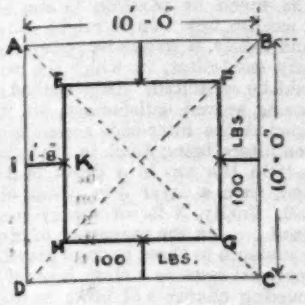


FIG. 1.

through the centres of gravity of the four triangles describe a square, E F G H. Instead of considering the weight as compounded into forces acting through the four centres of gravity, consider it as acting with equal force along the whole length of the lines forming this inner square. We do not then for a moment lose sight of the fact that the slab bears a distributed load and is equally supported around its whole margin. Multiply the total weight by the length of leverage, I K, and divide by the length of support, and the result is the strain per unit of length. Thus we shall have $\frac{400 \text{ lbs.} \times 1\frac{1}{3} \text{ ft.}}{40} = 16{\cdot}6$ lbs. strain per lineal ft.

This, however, is merely another way of looking at the same thing and obtaining the same result.

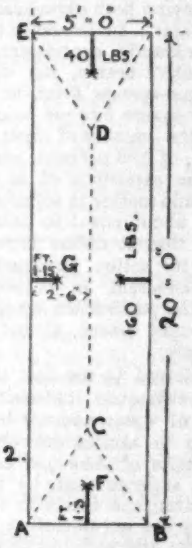


FIG. 2.

Let us pass on now to the rectangular slab (Fig. 2), of which, for our present purpose, I will treat in the manner recommended by Mr. Caws. According to him, this slab will not be nearly as strong as the square slab of the same area. The latter is safe to carry 400 lbs. Suppose that we consider the load on the rectangular slab to be the same. Then each end will have to carry 40 lbs., and each side 160 lbs., and the load on one end will be represented by the triangle ACB, having a perpendicular 4 ft. long, and the load on one side by the trapesium ACDE. The centre of gravity of ACB will be at the point F, 1·3 ft. from the end AB, and that of ACDE will be at the point G, 1·15 ft. from the side AE. "The attacking stress-causing force" on AB will be $40 \times 1{\cdot}3 = 53{\cdot}3$ lbs., and on AE $160 \times 1{\cdot}15 = 184$ lbs. But AB is 5 ft. long, and the strain on the end of the slab per lineal foot will therefore be $\frac{53{\cdot}3}{5} = 10{\cdot}6$ lbs.; and AE is 20 ft. long, and the strain per lineal foot will be $\frac{184}{20} = 9{\cdot}2$ lbs. We found, however, that the strain on the edges of the square slab was 16·6 lbs. per lineal foot,—considerably more, in fact, than the strain on either the side or end of the rectangular one, the weight on each slab being the same. It follows that the oblong slab is the stronger of the two, and, instead of its being true that "the more nearly square the slabs, the stronger they are," the direct opposite is the truth, namely, "*the more nearly square the slabs the weaker they are.*"

Mr. Caws's haste has evidently led him into two errors—the first, as I have already explained, being his omission to divide the total strain by the length of the side upon which it is exerted (it will be wise here to remember that of all rectangular figures of the same area the square has the shortest enclosing lines); and the second error is that he forgets that the longer the rectangle in proportion to its breadth the narrower becomes the trapezium, and, consequently, the shorter the arm, or leverage, by which the load is transmitted to its support.

The last paragraph on page 210 shows clearly the steps by which Mr. Caws descended to his erroneous conclusion. "The centre of the trapezoidal area occurs farther from the supporting edge than the centre of a triangular area *of equal perpendicular*." That is perfectly correct, but the truth of it rests on the three last words, which I have italicised. And yet in the very next sentence Mr. Caws forgets this, and, applying the statement to a trapezium and a triangle of unequal perpendiculars, says:—"And thus the leverage, as well as the load of trapezoidal area, is greater, making the stress of the trapezoidal portion of rectangular slab more or less greater than that of the triangular area of *same slab*, as the rectangle departs more or less from square." If he had carefully examined his own figure (the middle one on page 211) he would have seen his mistake. The triangle there has a perpendicular of 12 ft., its centre of gravity being, therefore, 4 ft. from the support, whereas the trapezium has a perpendicular of only 10 ft., with a distance from centre to support of 3 ft. 7 in. In my diagram (fig. 2) the difference is proportionally greater, the measurements being—for the triangle, 4 ft. and 1·3 ft.; and for the trapezium, 2 ft. 6 in. and 1·15 ft. only.

I thank Mr. Caws very much for his answer to my question about central and distributed loads, and regret that I have not yet had an opportunity of examining his letter in the *Builder* of April 3, 1886.

GEORGE L. SUTCLIFFE.

*Sept.* 23, 1889.

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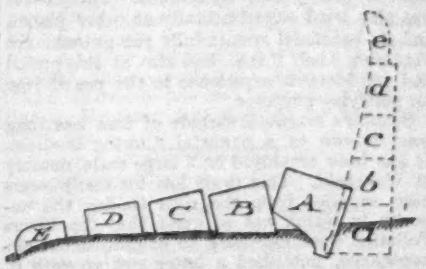
SIR,—In confirmation of Mr. Irwin's statement (p. 229 *ante*) I may mention that a few years ago, I witnessed the overthrow of a concrete retaining wall, whose base was of insufficient width to resist the back pressure which overthrew it.

The wall, when standing, was of the section shown by dotted lines on accompanying sketch, and was cast in the successive courses indicated by the letters *a*, *b*, *c*, *d*, *e*. When overthrown the respective courses occupied, approximately, the positions shown by A, B, C, D, E, on sketch.




If the wall had had to sustain simply vertical pressure, the fact of its being bedded in five courses would not have reduced its strength or stability. But when horizontal back pressure (due to water lodged behind wall) came into play, the level beds facilitated the disintegration *en bloc* which occurred.

Concrete floors and beams have to sustain *vertical* loads; and, therefore, horizontal lamination does *not* diminish their strength.

The analogue of the level bed in wall subject to horizontal pressure is not a *level bed*, but a *vertical joint*, in slabs or beams which are subject to vertical pressure. This fact has the following practical bearing:—

Workmen are liable to leave the casting of a large slab unfinished overnight, and to make a continuation with a vertical or oblique joint next day. This is a bad practice, though such is the enormous excess of strength in most slabs, that no ill results have followed instances of this bad practice which have come to my knowledge.

Nearly all natural stones are horizontally laminated; and, so long as they are set on their natural bed, their strength is not lessened by the lamination.

It is all very well to advocate "single dump," but you cannot make it answer practically for floors, any more than for walls. Specify "single dump" if you like, but no sensible contractor will obey you, or, if he does, he will spoil your floors.

You may, if you are silly enough, order your heavy plate girders with top and bottom flanges 2 in. thick in "single dump" of irons, but your iron-merchant or girder-builder will not, if he can help it, supply you with such an article.

Mr. Irwin speaks of *walls* in which—as he and we all know—"single dump" is impracticable: there *must* be courses; but he makes no reference to *floors*, in which he appears to have had no special experience. I have tried the "single dump" principle, and found it impracticable to get a decent surface by it. You cannot finish a "single dump" floor without lumps, bumps, and roughnesses.

Experience has convinced me that if you want a good floor you must coat your centres with plaster; then grout with pure cement over the plaster; then cast and ram (moderately) five-sixths (or thereabouts) of your floor thickness in single dump; and finally—as soon after as convenient—finish with one-sixth (or thereabouts) fine stuff top layer.

I have not the least interest in recommending one way more than another. But I say this is most decidedly the best method of all I have tried, and if you strain too hard at the gnat of "single-dump," you must swallow the camel of a humpy bad surface.

Mr. Irwin's idea that a corbel needs thickness at its outer extremity is very crude, and very misleading. It will not bear scientific analysis; as probably the author himself, on further reflection, will be the first to recognise: for the ideal cantilever, or corbel, of equal strength throughout, has no depth at its outer extremity.

Mr. Irwin is undoubtedly right in saying that too much pummelling damages the concrete. He is also right in recommending casting large lintels with voussoir joints, *if* they cannot be cast in one span. I am actually engaged at the present time in casting a large semi-vault or cove; and I am casting it sectionally with voussoir joint simply because it is not practicable to do such an enormous mass all at one go. The earth's crust, the *floor* on which we all in common tread, is largely built in horizontal laminations, of slabs infinitely thin and numerous. This great floor bears us all fairly well*; and I shall go on, as I have begun, bearing this great pattern in mind.

FRANK CAWS.

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SIR,—I am grateful for the correspondence relative to this subject which has appeared in the *Builder* for the last few weeks. More would have been welcome, but, as I foreshadowed in the number for Aug. 24, this information is not very readily parted with. Mr. Caws' experience differs from mine in several points. For instance, with regard to concrete when not overloaded with water for mixing purposes parting with that portion not wanted for hydration, Mr. Caws says:—"In passing to and fro under centering dripping from the concrete being cast above, I have enjoyed (!) too much experience in the shape of damage to hats and coats to accept without reserve the 'perfectly colourless' theory of Mr. Potter," &c., &c. My reply to this is that, whether Mr. Caws accepts my statement (of fact, not of theory) or not, it is nevertheless true, and common knowledge to workers in concrete. I well remember, about twenty years ago, a Government Inspector examining some new buildings in progress, and standing in the basement beneath a concrete floor which had just then been completed, noticing water dripping perfectly colourless on a clean-planed board, and expressing his surprise, when it was explained to him that water passed so freely away from cement.

If too much water has been used in making the concrete, it carries away with it sufficient cement to cause discolouration, and this possibly has been Mr. Caws' experience.

Then, as to a floor 100 ft. in length not expanding sufficient to disturb the mortar joints of the brick walls upon which it rested, Mr. Caws remarks that this is due to a certain amount of elasticity which brick walls possess; but the same thing has been done for 120 ft. in length where the walls were built of concrete, and in which the slightest cracks would have been visible, but where nothing of the kind has occurred. Mr. Caws instances a case where the expansion of a concrete floor dislocated the joints of a heavy stone cornice, subsequently contracting again; this is just what might be anticipated from the use of unseasoned cement, and has been my own experience, teaching me a lesson in the use of that material.

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* We presume our correspondent has satisfied himself that there is nothing but empty space under the earth's crust; otherwise the comparison is hardly to the point.—ED.

Mr. Caws says that, to prove Portland cement expands, some should be put in a bottle, when it will be found, on setting, to break it. My reply to this is that, so far from that being the case, Portland cement alone will not do so,—and I speak advisedly,—if of the proper fineness and proper age for use; and, obviously, there is far more reason to fear the result when the bottle is entirely filled with the material said to produce expansion than with a fixed proportion only mixed with a non-expansive material; the qualification that the cement must be hot is an unfair one, because, as is well known, cement will expand when in that state, and is unfit for any purpose whatever.

Dealing with the three-layer system of making concrete floors, Mr. Caws said that my assertion that the top and bottom layers would have but little connexion or bond to the middle layer is wrong, as they are practically homogeneous; but no correspondent who has followed him has endorsed this theory, while Mr. Irwin, in the *Builder* for Sept. 28, in giving the result of his experience with concrete, says:—"I have found in many instances that, no matter what care has been taken in breaking up the surface of the complete layer, the second one will not form with it a homogeneous mass." The gentle impingement admitted to be necessary after depositing a layer of concrete produces a comparatively smooth surface, and practically no bond can, therefore, take place between the materials forming the aggregate, and no homogeneity, as I understand the meaning of that word, can ensue. Mr. Caws admits this when he says the homogeneity results "by virtue of the great tenacity of the cement" (*Builder*, Sept. 7), and which I read as meaning the strength of the cement as a jointing material between the smooth under bed and the coarse upper bed of the succeeding layer. If a concrete wall has to be pulled down, workmen acquainted with the habits of the material will drive iron wedges in where the layers have been roughly levelled off to the top of the encasing panels, for they learn that it is easier to part it there than in the actual monolithic portions.

I am in accord with Mr. Caws in regard to concrete floors being constructed with far less iron in combination than is usually the case. Lieut.-Col. Seddon proved this years ago when cement was only about one-half the strength it can be obtained now; a slab of concrete 14 ft. 6 in. by 13 ft. 6 in. and 6 in. thick clear of all supports, and with 18 in. bearing on all four sides, was tested twenty-one days after being made; the slab was composed of one part of cement and four parts of broken brick ballast, screened or gauged to 1 in. mesh, well beaten when deposited in place, and ultimately covered with water. Eighty men marched on to it, marked time at quick and double, then jumped; it was afterwards loaded with bricks piled over its unsupported area.

There was no result from the jumping, but it broke suddenly and without any warning when 10½ tons weight had been evenly distributed over the unsupported area. Another experiment upon a similar slab was to drop a weight of 4 cwt. from a height of 4 ft. over the centre, the result being that the weight broke a hole clean through the floor, without making any radiating cracks. Not only do these experiments go to prove that but little or no iron is needed for floors of ordinary dimensions, but that they are able to withstand sudden impact, a qualification which, as Mr. Fawcett states, they are not, as a rule, credited with. I made an upper floor of a cottage of concrete about eight years since of a slab of concrete 4 in. thick and 12 ft. each way between bearings, which were only on three sides, no iron being employed. The tenant complained for a year or two of an uneasy feeling when sitting in his room below, but he eventually got resigned to the situation.

Mr. Fawcett, in the *Builder* for August 17, says that the result of his experiments with slabs of concrete subjected to a severe fire was that they broke with very slight impact, and that "no concrete having Portland cement as a matrix would retain its strength after a severe fire." Mr. Hyatt, in his book, page 20, states that a slab 6 ft. long, 2 ft. wide, and 7½ in. thick, with iron embedded therein, and loaded with 300 lb. per square foot, resisted an intense heat for ten hours, and remained sound and strong after water had been pumped upon it. My object in bringing forward these statements of the opposite results of experiments and of actual practice in the use of the very same material, is to point out the necessity of exhaustive trials being made of cement concrete as a floor material in a common way, and which, if successful, could be accepted as reliable data for the construction of fire-proof floors for ordinary dwellings, as well as more pretentious buildings. The R.I.B.A., or some other Society, might,—as I pointed out years ago, on the scores of healthfulness and of the diminution of danger from fire which would result therefrom,—take up the subject and confer an immense public benefit. My remarks in the *Builder* of August 24 with regard to patentees and specialists were not intended as a reproach; indeed, just the reverse, for with subjects like concrete fire-proof construction the reward is often quite inadequate to the money and time spent in experimenting thereon, and bringing an invention well before the public. The late Mr. W. H. Lascelles once told me he had spent thousands of pounds in concrete experiments, extending over many years, and that by the time his patents would expire he should probably be just commencing to reap the benefit therefrom, but the lapse of his patent-rights would let in other people to make use of the knowledge acquired by the expenditure of so much time and money, to their gain and his loss.

THOMAS POTTER.

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SIR,—Mr. Frank Caws (p. 229, *ante*) again mistakes me in saying that I regard "simple slabs of concrete as fit only for the houses of the very poor." I do not regard them *as* fit until the concrete is finished on the top in *some way* (preferably with wood blocks) and the ceiling at least *set*. "Good linoleum or carpet" is not often found in the houses of the very poor, especially in London; the boards are generally bare and very often walked upon with *bare feet*, and a wood floor is preferred and used more on account of its warmth than anything else. I understand that Mr. Caws is not a practising architect in London, otherwise he would know that in buildings of a "superior class" here a wood floor is considered absolutely necessary in living-rooms for warmth and comfort. I cannot say that I employed my own floor myself during the short time I was in practise, but I *can* say that my floor has been adopted by many well-known architects and employed by them, and this, to my mind, is of far more importance, as it tends to clearly show that the profession are in favour of it, and want something better than an ordinary concrete slab, or concrete and iron joist floor.

I should have had a word to say about Mr. Caws' theory as to the strength of concrete slabs, but I notice that others have taken it up already.

Oct. 2, 1889. MARK FAWCETT.

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# The Student's Column.

## WATER-SUPPLY.—XIV.

### FILTRATION (*continued*).

THE purifying properties possessed by certain forms of iron have been known and taken advantage of for many years by that mineral being extensively employed, not only in domestic, but in water-works filters on a large scale; and the success attending the different processes involved, are of sufficient practical importance to warrant our entering into the subject in some detail.

About thirty years ago, Dr. Medlock, in conjunction with Mr. Joseph Quick, M.Inst.C.E., made a number of experiments on the purification of Thames-water by metallic iron. The water of the river at Battersea was left in contact with iron wire and plates, in a large tank, for twenty-four hours, and the improvement in quality was very marked. The process was also tried experimentally at other places, and its beneficial results fully recognised. Sir Frederick Abel, F.R.S., had also at this period had considerable experience in the use of iron for purifying purposes.

Spencer's magnetic carbide of iron has long been known as a powerful filtering medium. It has been employed on a large scale, notably at Wakefield. This town has for many years been supplied from the river Calder, the impurity in which was so great that the Rivers Pollution Commissioners, to emphasise the circumstance, published a letter written with it. Yet this water was rendered wholesome by filtering it through Spencer's material, and the death-rate of the place, from zymotic and general causes, compares very favourably with many large towns in its vicinity.

Of recent years Professor Bischof's spongy-iron has claimed much attention. This material is extensively employed for domestic filters, and possesses the advantage of not only materially reducing the hardness of water, but is a powerful destroyer of organic matter in solution and micro-organisms. Its use is not, however, confined to small filters. Mr. William Anderson, M.Inst.C.E., in his description of the Antwerp Waterworks,* has shown how it may be applied on a large scale. It was proposed to supply Antwerp from the river Nethe, eleven miles from that city, but the quality of the water was such, that it would have been absurd to utilise it before compelling it to undergo extensive purification. Many experiments were carried out, with a view of finding the best method of doing this, and eventually it was agreed to use Bischof's spongy-iron. It was determined, in the first instance, to provide for twelve hours' subsidence of the river water, to allow the grosser particles of suspended matter to settle; next, the water was to be decanted from the surface on to a layer of ordinary filter-sand, underneath which would be a bed of spongy-iron and gravel, mixed. The water was then to be exposed as much as possible to the air, in order to oxidise any iron it might have dissolved; and finally, it was to be passed through an ordinary sand-filter, in which the red iron oxide would be separated. This method of filtration having proved satisfactory, Mr. Anderson constructed the filter-beds accordingly, the spongy-iron filters being filled in the following manner:—"On the top is a depth of 2 ft. of Meuse sand, then a layer 3 in. thick of fine gravel, and, finally, 3 ft. of spongy-iron and gravel mixed . . . in the proportion of one part of iron by measure to three parts of gravel. The filtering material rests on a close layer of brick on flat covering channels of brick on edge, all laid dry." This was believed to be capable of filtering at the rate of about 140 gallons per square foot per day. The sand-filters showed in descending order a 2 ft. 6 in. layer of Meuse sand, 3 in. of fine gravel, and, finally, a bed of coarse gravel 1 ft. in thickness. This was thought to be able to filter at the rate of 117 gallons per square foot per day.

We are not now concerned with the other details of the construction of these filter-beds, nor of the various additional methods adopted in dealing with the water, before it is finally delivered to the public. The question we have before us, is whether spongy-iron has any advantage over other filtering media, in regard to its rendering water purer from a hygienic point of view; and if so, whether its practical use on a large scale is successful. It is admitted, as will have been observed in our remarks on the quality of water, that the material is capable of producing wonderful results, in removing both organic and organised matter from water. In reference to the latter, Dr. Percy Frankland's experiments show that after one month's action, the water passing through an iron-sponge filter, at the rate of 0·45 gallon per square foot per hour, produced a reduction in the number of organisms present after filtration, of 99·8 per cent. less than before filtration. The capability of spongy-iron in removing organic matter in solution from water is said to be about equal to that of animal-charcoal, but that it differs from this latter substance in its action, inasmuch as it is so much more effectual in destroying micro-organisms. The purification by spongy-iron is probably brought about almost entirely by chemical agency.

We have referred to the fact that filtration through this substance materially diminishes the hardness of water, and we have seen that that hardness is almost entirely due to the presence of salts of lime and magnesia, so it is natural to suppose that, by their elimination, in softening, the filters in time would be clogged up by the accumulation of these and other products; and such has proved to be the case, but the filters may be brought into working order again by breaking up the crust formed.

In order to answer the second part of the question before us, namely, whether the use of spongy-iron on a large scale is successful, let us now return to the results obtained at Antwerp. In a subsequent communication to the Institution of Civil Engineers, Mr. Anderson says* that "the operation of the process as far as the effect upon the water was concerned, left nothing to be desired: uninterrupted work for nearly four years, did not appear to have materially enfeebled the power of the filtering medium, nor to have sensibly diminished its quantity." The waters of the Nethe proved to be so impure, however, that the filters were not able to deal with more than half the quantity expected; whilst the upper part of the gravel and spongy-iron bed, became hard (largely due to the softening process) and filled up with slimy matter. It was necessary therefore, periodically, to remove the layers of sand and grit in the upper part of the filters, to break up the crust and wash away the matter that had accumulated. Increasing demand for the water in Antwerp then caused Mr. Anderson, in conjunction with Mr. G. H. Ogston, Assoc. Inst. C.E., to set to work to devise some other means of utilising the properties of iron, whereby the supply could be kept up at less sacrifice of capital and space. Eventually, acting on a suggestion of Sir Frederick Abel, the problem was solved. It consisted in simply agitating a comparatively small quantity of

* Min. Proc. Inst. C.E., vol. lxxii. (1883), p. 24.

* Min. Proc. Inst. C.E., vol. lxxvi. (1886), p. 270

iron with the water to be treated, by passing the latter through slowly revolving cylinders, which were furnished, interiorly, with curved ledges, for scooping up the particles of iron and showering them down through the water, in turning. By continually rubbing against each other and the inner surface of the cylinders, and by falling through the water, the surfaces of the pieces of iron were kept clean and in active condition. It was found that iron in almost any divided form was suitable for the purpose, but that some kinds were more rapid in purifying than others. Cast-iron borings and turnings were preferred, being found to be the most active, then, in order of merit, spongy-iron, granulated cast-iron, and wrought-iron and steel turnings.

We cannot go into the whole process, but suffice it to say that by means of these "revolvers," subsequent aëration, sand-filtration, and minor contrivances, the water was very rapidly and effectively purified. Contrasting the original spongy-iron filters at Antwerp with the effects produced by the more recent method, M. Ad. Kemna, a well-known Belgian authority, says,* "Que l'eau de la Nèthe est peu chargée de calcaire; après épuration elle marque 9 degrés hydrotimétriques. Il a été remarqué qu'avec l'ancien filtre à fer proprement dit, la dureté diminuait en proportion considérable; mais l'action des revolvers ne semble pas avoir beaucoup d'effet sur l'abaissement du degré hydrotimétrique."

Antwerp is not the only place where spongy-iron has been employed in purification. It has been used in the Stamford Waterworks and elsewhere, but we thought it useful to take a single instance of its employment, and to follow out and briefly chronicle the main practical results obtained.

With respect to the general question of the purification on a large scale, we think it may be admitted that when the water is of fairly good quality it may usually be rendered perfectly wholesome by the ordinary methods of sand filtration, or sufficiently so, to satisfy the requirements of all but the most fastidious persons; but when inferior water is to be dealt with, there can be no doubt that it may be more effectually purified by the additional employment of spongy-iron, or some such method as Mr. Anderson's Revolving Iron Purifier.

## RECENT PATENTS.

### ABSTRACTS OF SPECIFICATIONS.

13,167, Bakers' Ovens. W. Jago.

By means of this invention, in order to equalise the heat of the ovens, air-chambers are arranged, and suitable flues and dampers are used. A "travelling-plate," a device known to bakers, but covered with tiles, is used, and also a small sliding door, to be put into use when only the peel is used for filling the oven. On the tiles of the travelling-plate are suitable marks which make impressions on the bread.

15,510, Fastenings for Doors. J. Turner.

This invention consists of an improved combination of door-bolt, and bar and door-chain. The chain is attached to a loop, or ear, in a staple fixed to the door-post, the length of the chain being just sufficient to allow the sliding-piece to be withdrawn from its bearings when the door is shut close. When the chain and bolt are not in use the bolt is inserted in a supplementary loop, which is a more sightly and compact position.

15,564, Paint for Ships' Bottoms. J. Baynes and others.

By means of this invention paints, in which carbolate of copper and arsenic are necessary ingredients, are rolled and mixed by special mills; and the paint is designed to be used over a priming composition, to prevent actual contact between the iron of the ship's hull and the copper in the paint.

15,613, Water Waste-preventing Cisterns. T. Panario.

According to this patent the cisterns are fitted with appliances so that the bends of the syphons with which they are generally fitted, and by which they are emptied, may always be above the upper edges of the sides of the cisterns, so as to render it impossible that any waste of water can be created by a continuous flow through the syphons.

10,518, Whitewash Brushes. C. H. Hobbs.

According to this invention, in order to prevent the separating or "forking" of the bristles or fibres, a small piece is inserted so that the bunches of bristles or fibres have a smaller thickness at the ends than they have in the central part, and the root-ends of the bristles are covered by a band, which is firmly nailed to this piece, the object of which is to support the bristles or fibres and give protection thereto.

11,658, Plastering Walls and Ceilings. G. Bastucchi.

According to this patent, a pasty mass of cement and magnesite, with which the desired colouring has been mixed, is plastered on to the walls or ceiling with an ordinary plastering-trowel; it is then faced-up, smoothed, and decorated, and glazed or polished with a hot iron. A marbled appearance can be obtained by a clouded colouring of the mass. The advantages of using the hot iron are many: a higher glaze is produced, greater durability, and the surface may be washed over with water. The walls are not liable to be affected by disease germs, and the plastering is especially suitable for use in schools and hospitals.

### NEW APPLICATIONS FOR PATENTS.

*Sept.* 16.—14,567, C. Thomerson, Fixing Head and other Pipes against Walls, &c.—14,590, H. Groves and J. Stewart, Electric Bells.

*Sept.* 17.—14,643, H. Torrance, jun., Portland Cement.—14,648, G. Bailey, Bakers' Ovens.—14,653, A. Clay, Glazed Bricks and Tiles.—14,664, A. Rockwell, Door-bell Mechanism.

*Sept.* 18.—14,687, H. Sanderson and C. Ehlers, Reversible Windows.—14,702, J. Bradshaw, Chimney-pot or Top.—14,706, J. Morris, Ventilator.—14,723, F. Fehse, Decorative Tiles, &c.—14,733, D. Nicoll, Waterproof Slabs and Blocks.—14,739, J. Sim, Fittings for Doors and Windows.

*Sept.* 19.—14,766, W. Snelgrove and W. Avery, Door-checking Brackets and Fittings.—W. Snelgrove and W. Avery, Fastenings and Guards for Doors.—14,778, J. Macmeikan, Coping Bricks.—14,772, A. Haughton, Gates, Doors, &c.—14,787, A. Mitchell, Joint for Drain-pipes, &c.—14,808, A. Black, Lead Water-pipes.—14,797, R. Barton, Paints, &c.

*Sept.* 20.—14,883, A. Tattersall, Jointed Brace for Boring Holes in Corners.—14,853, A. Dunbar, Splitting, Dressing, or Planing Wood.—14,863, A. Planner and L. Hakeman, Distemper Colouring.—14,877, H. James, Girders for Bridges.

*Sept.* 21.—14,889, A. French and J. Gordon, White Lead.—14,899, A. Morrison and M. Ingram, Water-closet.—14,915, T. Harris, Stoves or Fireplaces.—14,936, S. Ainge, Carpenter's Cramp.

### PROVISIONAL SPECIFICATIONS ACCEPTED.

6,266, A. Brown and H. Bruce, Pivots and Fittings for Sashing Windows or Sashes.—9,662, J. Morrell, House Sinks and Drains.—12,942, J. Howie, Syphon Flushing Cisterns.—12,949, J. Armstrong, Cisterns, &c.—13,046, W. Bramwell, Chimney-tops.—13,153, F. Barnett, Ventilating and Purifying Sewers, Drains, &c.—13,380, G. Zaehmann, Door-lock.—13,767, F. Lane, Horizontal Sawing Machinery.—13,915, T. Kershaw, Door-knobs or Door Furniture.—13,961, A. Brooke-Hunt, Door-knobs.

### COMPLETE SPECIFICATIONS ACCEPTED.

*Open to Opposition for Two Months.*

15,223, S. Russell, Window-fastening.—15,469, G. Beck and E. Hancock, Scaffolding, &c.—15,668, W. Smith, Wood Planing-machines.—15,722, W. Taylor, Step-ladders.—16,846, C. Allen and Others, Glazing.—17,257, W. Cussans, Imitation Marble Mosaics.—2,827, W. Williams, Wood Paving.—5,942, J. Oldroyd, Window-fasteners.—5,959, R. Home, Fastening for Sash-windows.—11,970, A. Martin, Machines for Moulding or Impressing Wood, &c.

* Bull. Soc. Belge de Géologie, Tome III. (1889), Pr.-vb. p. 131.

## RECENT SALES OF PROPERTY:

### ESTATE EXCHANGE REPORT.

Sept. 23.—By Humbert, Son, & Flint.

| | |
|---|---|
| Bushey, Herts.—Enclosure of f. building land, containing 9a. 3r. | £1,710 |
| F. villa residence in Park-rd. | 350 |
| A plot of f. building land | 157 |

Sept. 24.—By Rutley, Son, & Vine.

| | |
|---|---|
| Somers-town—12, Stibbington-st., u.t. 51 yrs., g.r. £15, r. £72. 16s. p.a. | 300 |
| Holloway—6, Queen's-sq., u.t. 63 yrs., g.r. £4. 4s., r. £24. 1s. p.a. | 150 |

By Frank Jolly & Co.

| | |
|---|---|
| Forest-gate—63, Dames-rd., u.t. 80 yrs., g.r. £7, r. £28 p.a. | 250 |
| Upton Park, Boleyn-rd.—Two plots of f. building land | 60 |
| Wapping—1 to 10, Mary's-pl., u.t. 84 yrs., g.r. £50, r. £153. 8s. p.a. | 375 |

By J. Baker & Sons.

| | |
|---|---|
| Ealing—5, Craven-gdns., u.t. 80 yrs., g.r. £3. 5s., r. £60 p.a. | 725 |

By J. Jacobs & Sons.

| | |
|---|---|
| Brompton—22, Michaels-grove, u.t. 38 yrs., g.r. £10, r. £100 p.a. | 1,000 |
| 27, Michaels-grove, u.t. 38 yrs., g.r. £4, r. £100 p.a. | 1,050 |
| 13, Montpelier-sq., u.t. 35 yrs., g.r. £15, r. £90 p.a. | 850 |
| 9, Alfred-st., u.t. 35 yrs., g.r. £12, r. £70 p.a. | 650 |
| 12, Montpelier-st., u.t. 16½ yrs., g.r. £21. 5s., r. £100 p.a. | 350 |
| 5 and 7, North-ter., u.t. 17 yrs., g.r. £18. 12s., r. £150 p.a. | 910 |

Sept. 25.—By Baxter, Payne, & Lepper.

| | |
|---|---|
| Bickley, Kent—"South Lawn" and 2a., f. | 4,000 |
| Bromley, London-rd.—A plot of f. land | 1,000 |
| "Westfield Cottage," f., o.r. £75 p.a. | 810 |

By C. R. Croos.

| | |
|---|---|
| North Kensington, Swinbrook-rd.—A rental of £80 p.a., u.t. 77 yrs. | 670 |
| By J. Jacobs & Son. | |
| Brompton—7, South-st., u.t. 17 yrs., g.r. £10., r. £30 p.a. | £660 |
| 1a, Pelham-st., u.t. 24 yrs., g.r. £3, r. £40 p.a. | 250 |
| 1, Neville-ter., u.t. 65 yrs., g.r. £3. 8s., r. £65 p.a. | 750 |
| 38 and 45, Beauchamp-pl., u.t. 34½ yrs., g.r. £17. 12s., r. £120 p.a. | 1,200 |
| Knightsbridge—The "Paston Head," u.t. 5½ yrs., g.r. £100, r. £300 p.a. | 400 |
| By E. Kettley & Co. | |
| Leytonstone—6 to 10, Arthur-ter., u.t. 75 yrs., g.r. £11. 12s., r. £80 p.a. | 580 |

Sept. 26.—By Newbon & Harding.

| | |
|---|---|
| Clerkenwell—12, Albemarle-st., f., r. £45 p.a. | 940 |
| Canonbury—12 and 13, Northampton-grove, f., r. £56 p.a. | 705 |
| Stoke Newington—160 & 162, Albion-rd., f., r. £80 p.a. | 1,010 |
| Hackney—f.g.r. of £14 p.a., reversion in 71 yrs. | 350 |
| Balls Pond—90, Balls Pond-rd., u.t. 73 yrs., g.r. £9. 8s., r. £45 p.a. | 300 |
| Highbury—No. 84, Highbury New-pk., u.t. 60 yrs., g.r. £15, o.r. £150 p.a. | 600 |
| New Southgate—7, Southgate-villas, f., r. £50 p.a. | 600 |

By E. Stimson.

| | |
|---|---|
| Kennington—3 to 21 (odd), Thomas-st., u.t. 76 yrs., g.r. £56, r. £351 p.a. | 2,100 |
| Old Kent-road—1 to 4, Hyndman-st., u.t. 55 yrs., g.r. £16, r. £88. 8s. p.a. | 435 |
| 11 to 19, Aldred-st., u.t. 21 yrs., g.r. £30. 15s., r. £163. 16s. p.a. | 400 |
| 29, New Cross-rd., u.t. 35 yrs., g.r. £8. 10s., o.r. £50 p.a. | 420 |
| Forest Hill—43 to 51 (odd), Stanstead-rd., f., r. £130 p.a. | 1,120 |
| Strand—16 & 17, Malden-lane, and 8, Bull-in-ct., u.t. 7½ yrs., g.r. £170, r. £371 p.a. | 350 |

By E. Holsworth.

| | |
|---|---|
| Stratford—37 and 39, Norfolk-ter., u.t. 92 yrs., g.r. £7, r. £46. 16s. p.a. | 190 |
| 61 and 63, Norfolk-ter., u.t. 92 yrs., g.r. £7, r. £46. 16s. p.a. | 140 |

By Farebrother, Ellis, Clark, & Co.

| | |
|---|---|
| Southgate—4 to 8, Broomfield-villas, f., r. £140 p.a. | 1,830 |
| 10, 11, and 12, Broomfield-villas, f., r. £102 p.a. | 1,350 |
| 4, Fairview-ter., f., r. £22 p.a. | 310 |

Sept. 27.—By Prothero & Morris.

| | |
|---|---|
| St. John's Wood—33, Queen's-rd., u.t. 47 yrs., g.r. £12. 10s. | 850 |

By C. & H. White.

| | |
|---|---|
| Bermondsey—83, St. James's-rd., u.t. 51 yrs., g.r. £3, r. £33. 15s. | 310 |

[*Contractions used in this list.*—f.g.r. for freehold ground-rent; l.g.r. for leasehold ground-rent; i.g.r. for improved ground-rent; g.r. for ground-rent; r. for rent; f. for freehold; c. for copyhold; l. for leasehold; e.r. for estimated rental; u.t. for unexpired term; p.a. for per annum; yrs. for years; st. for street; rd. for road; sq. for square; pl. for place; ter. for terrace; yd. for yard, &c.]

## MEETINGS.

Monday, October 7.

*Society of Engineers.*—Mr. J. H. Cunningham on "Pin-connected v. Rivetted Bridges." 7·30 p.m.

*Liverpool Architectural Society.*—Opening Address by the President (Mr. T. Mellard Reade). 7 p.m.

*Clerks of Works' Association (Carpenters' Hall).*—Monthly Meeting. 8 p.m.

Friday, October 11.

*The Junior Engineering Society (Westminster Palace Hotel).*—Professor John Perry, F.R.S. (President Elect), on "Mechanical Engineering in Electrical Industries." 8 p.m.

## Miscellanea.

**Guildhall Improvements.**—At a cost approaching 2,000*l.*, improvements of a structural character are now being effected at the Guildhall, under the superintendence of the architect, Mr. A. M. Peebles. The object of the alterations is chiefly to make a worthy approach to the magnificent council chamber designed by the late City Architect, Sir Horace Jones. When the works are completed, members will no longer be compelled to elbow their way sideways up some narrow side steps, with the prospect of a complete block at the other end. The brass entrance-gates, with their griffins and other ornamental designs, will no longer be obscured from view. There will be a wide lobby, through which members will pass to the Court of Aldermen and Court of Common Council, and the latter will be approached by a handsome flight of steps. The additional space needed in consequence of these desirable improvements is to be obtained by the removal of certain offices that have hitherto immediately faced the entrance of the chamber.—*City Press.*

**The Canal between the Rivers Obi and Janisey.**—According to advice from St. Petersburg, the works on the canal system for connecting the Obi and the Janisey are being vigorously prosecuted, and it is hoped that they may be completed by next spring. This canal will be of great importance to Southern Siberia. The Government has decided upon constructing a railway,—280 versts in length,—uniting the Obi and the Volga, and has further under consideration a plan for its ultimate extension to the River Kama, a distance of 75 versts.

**The New York Streets.**—The report of Mr. Coleman, Street Commissioner of New York, for the years 1887 and 1888, which has just been published, contains some interesting items of information, and perhaps none more so than the following, which shows how the pavements of the city suffer from continual disturbance. During the period covered by the report, 98 miles of gas-mains were laid, 28·58 miles of trench opened for subways, 37·9 miles of salt-water pipes laid, 10,500 lineal feet of double tramway track laid, 17,973 excavations made for house-connexions, 15·42 miles of water-pipe laid, and 7·12 miles of sewers constructed, while the excavations for repairs to sewers and water-pipes were almost innumerable. Some interesting figures are also given in the report as to the cost of street-cleaning. Comparing 1888 with 1882, the increase of population was 320,000, or 25 per cent.; that in miles of streets swept 17,818, and in loads of material collected 420,546. The cost of cleaning the streets per mile has been reduced since 1882 from 40 dols. 33 cents to 29 dols. 33 cents, and per load of material collected from 90 dols. 24 cents, to 81 dols. 67 cents. This shows a decrease since 1882 of 11 dols. per mile, or 27 per cent., in street cleaning, and per load of material collected a decrease of 8 dols. 57 cents, or 9¼ per cent. The cost of sweeping by day-work above Fourteenth-street was 1 dol. 8 cents per load, or 11 dols. 18 cents per mile in 1882. In 1888, it was 87 cents per load, or 8 dols. 64 cents per mile. To collect and remove a cartload of snow in 1882 cost 93 cents, and in 1888 95 cents. The cost of final disposal of ashes, garbage, and sweepings, not including supervision, was 21 cents per cartload in 1882 and 18 cents in 1888. In 1888, 1,259,459 dols. was granted for cleaning the streets of New York, while the actual amount expended was 1,255,880 dols.

**Chapel at Ruthin.**—The memorial stone of the new Welsh Presbyterian Chapel and Schoolroom, Ruthin, North Wales, was laid on the 29th ult. The building will occupy a site in Well-street. The style is Gothic. The chapel is to seat 450 persons, and the sittings are to be arranged in a circular theatre form, with an isacoustic curve from the pulpit, with stepped aisles leading to the body. The seats and other fittings are to be of pitch pine, varnished, together with the pulpit and deacons' pew. The schoolroom, 41 ft. 6 in. long and 24 ft. wide, is placed at the rear of the chapel, with a minister's vestry, 14 ft. by 12 ft., also a lavatory, book-closet, and other conveniences, all in easy proximity to each other, and communicating with the chapel by means of a passage. Below is the cellar, containing boiling-room, heating cellar and coals, provided with sinks, boiler, cooking-range, and other conveniences. The roof of the chapel is to be in one span of 54 ft. (inside measurement), supported by stained pitch-pine hammer-beam principals. The walls are to be built of local stone, with limestone dressings, and are plastered internally, having the jambs and arches of window openings blocked in ashlar courses. The architect is Mr. T. G. Williams, of Liverpool, under whose supervision the work is now being carried out, and whose plans and specifications were accepted in competition. The contractor is Mr. Richard Lloyd, builder, of Corwen. The cost, exclusive of land, will not exceed 2,000*l.*

**Cardiff.**—On September 24 the old church of St. John's was thrown open to the public, a commemoration-service being held in the morning, at which the Dean of Llandaff preached. The galleries have been cleared away, and two new aisles added, one on the north and the other on the south side. The roof has been thoroughly repaired. The old plastering in the panels has been taken away and wood substituted, but nearly all the old oak principal rafters have been made use of again, as well as the ribs which show in the nave and old aisle roofs. The tower-arch has been opened out. The two new aisles will accommodate about 550. Messrs. Shepton & Sons were the builders. The tile floors were supplied by Messrs. Godwin & Sons, Withington. Messrs. Kempson & Fowler, of Llandaff, are the architects.

**Seizure of an Obelisk for Debt.**—A curious case of seizing an obelisk for debt has occurred in Austria, a firm of carriers at Bozen having seized the cases containing the obelisk which was to be erected upon the summit of the Ortler mountain, 3,900 mètres in height, on the frontier between the Tyrol and Italy, upon a claim for transport.

**Plumbers' Company.**—At the Quarterly Court, held at the Guildhall on Monday last, Mr. W. H. Bishop was re-elected Master, Mr. Chas. Hudson was re-elected Warden, and Mr. Philip Wilkinson, architect, was elected Renter Warden, for the current year. Sir Algernon Borthwick, Bart., M.P., and Mr. A. Ainslie Common, F.R.S., were elected Stewards. A requisition, signed by the Mayor of Cardiff, the Medical Officer of Health, and the Principal of the University College for South Wales and Monmouth, and a large number of architects and leading citizens, was presented, desiring that Cardiff should be created a centre for the examination and registration of plumbers, in accordance with the Company's general system. The Court resolved to comply with the requisition. It was also resolved to award prizes to successful students in the plumbing classes in thirteen provincial towns. Communications were reported from fifty-five boards of guardians and sanitary authorities expressing approval of the registration system, and stating that, in accordance with the suggestion of the President of the Local Government Board, they had resolved to employ registered plumbers in the buildings under their control.

**The English Iron Trade.**—While business in the English iron market has been somewhat checked by the high prices, and the practice of withholding important contracts immediately before the quarterly meetings, the upward movement of values continues. This is especially noticeable in Scotch maker's irons, which have gone up again this week, to the extent of from 1s. 6d. to 2s. 6d. a ton, accompanied by a further rise in the warrant market. Middlesbrough pig has advanced 6d. a ton, and west coast Bessemer iron, 1s. Late rates are fully maintained in Lancashire and the Midland districts. Manufactured iron remains fairly active, and stiff in price. Another 2s. 6d. advance is reported from the north, and Welsh bars have been put up 5s. a ton. Tinplates are more animated, and 3d. per box dearer. Trade in steel is slightly more limited than it has recently been, but prices are hardening notwithstanding, which, seeing the advancing tendency in pig-iron, is not to be wondered at. A fairly large amount of new work is offering to shipbuilders. Engineers have nothing to complain of, and go on working briskly.—*Iron.*

**A Water-Logged Country.**—It is a somewhat startling proposition to put forward that the network of railway embankments and roads which British enterprise has spread over the face of India has conduced in some measure to spread disease and death among the native population. There can be doubt, however, that if the matter be thoroughly investigated, the fact will be found to be as stated. The question has been brought prominently to the front in the annual report of the Sanitary Commissioner for Bengal, Dr. Gregg, who, struck by the terrible mortality from malarial fever in his province, and by the steadily increasing number of deaths from this cause year by year, sought to grapple with the problem. His conclusion practically amounts to this, that the roads, bunds, and embankments that form a network over Bengal, are simply water-logging an already imperfectly drained country. The point is well worthy the attention of the Public Works Department and of those responsible for railway construction in India.—*Indian Engineer.*

**Amsterdam.**—The Municipality of Amsterdam appears to be actively engaged in competing with its rival ports, Rotterdam and Antwerp. The works on the new canal that is to connect this port with the Rhine are being pushed actively forward, and they are to be completed seven years earlier than calculated. Work is also carried on with the locks at the end of the North Sea Canal at Ymuiden, the completion of which would no doubt greatly improve Dutch trade.

**Salters' Hall.**—The principal rooms of the Hall belonging to the Worshipful Company of Salters, in St. Swithin's-lane, E.C., including the large banqueting-hall, are now undergoing entire redecoration. The work is being executed by Messrs. Johnstone, Norman, & Co., under the direction of Mr. H. Dawson, Surveyor to the Company.

**New Railway Station at Kiel.**—A new large railway station is to be built at Kiel, the traffic having increased in the old station very heavily of late years. However, the final plans have not yet been adopted. Most probably the building will be raised upon the old site.

**A Canal through Italy.**—The Italian engineer, Signor Vittorio Bocca, has submitted a plan to the Italian Government for a canal through Italy, from the Tyrrhenian Sea to the Adriatic. The canal is to start from Montalto di Castro, in the province of Rome, passing through the peninsula in a north-easterly direction, and ending on the east coast at Fano. The canal is to have a length of 200 kilomètres, a breadth of 80 mètres, and a depth of 12 mètres, so that it would be passable by the largest ships. By this canal the great important provinces of Rome, Grosseto, Siena, Arezzo, Perugia, Pesaro, and Ancona will become directly connected with the sea. Moreover, the swampy parts of the country through which the canal runs are to be laid dry and even for agriculture, including the lakes Bolsena, Chiusi, and Montepulciana, whereby an area of 450 square miles of land are to be reclaimed. The time for carrying out this project is estimated at six years, and the cost at 25,000,000*l.*

**Projected Canal in Sweden.**—A project is under consideration in Sweden for the purpose of constructing a canal from the large lake Veneru, in Central Sweden, to the Cattegat. The canal would connect the two towns of Uddevalla and Wenersborg, and be important to the wood and iron export trade in Central Sweden. Its length is estimated at 25 kilomètres, with 8 kilomètres of lakes. The depth is to be 7 mètres, allowing of the passage of vessels of 3,000 tons. There are to be locks 116 mètres in length and 15 in width.

## PRICES CURRENT OF MATERIALS.

| TIMBER. | £. | s. | d. | £. | s. | d. |
|---|---|---|---|---|---|---|
| Greenheart, B.G. ....ton | 7 | 0 | 0 | 7 | 15 | 0 |
| Teak, E.I.....load | 12 | 0 | 0 | 14 | 0 | 0 |
| Sequoia, U.S.....foot cube | 0 | 2 | 8 | 0 | 3 | 0 |
| Ash, Canada.....load | 3 | 10 | 0 | 5 | 0 | 0 |
| Birch ,, ..... | 3 | 10 | 0 | 6 | 0 | 0 |
| Elm ,, ..... | 4 | 0 | 0 | 5 | 0 | 0 |
| Fir, Dantsic, &c. ..... | 2 | 0 | 0 | 3 | 10 | 0 |
| Oak ,, ..... | 3 | 10 | 0 | 4 | 10 | 0 |
| Canada ..... | 5 | 10 | 0 | 7 | 10 | 0 |
| Pine, Canada red ..... | 3 | 0 | 0 | 4 | 0 | 0 |
| ,, yellow ..... | 3 | 10 | 0 | 5 | 5 | 0 |
| Lath, Dantsic.....fathom | 4 | 10 | 0 | 5 | 10 | 0 |
| St. Petersburg..... | 5 | 0 | 0 | 6 | 10 | 0 |
| Wainscot, Riga, &c.....log | 2 | 15 | 0 | 4 | 5 | 0 |
| Deals, Finland, 2nd and 1st...std.100 | 9 | 0 | 0 | 11 | 0 | 0 |
| ,, ,, 4th and 3rd..... | 7 | 0 | 0 | 8 | 15 | 0 |
| Riga ..... | 7 | 0 | 0 | 9 | 0 | 0 |
| St. Petersburg, 1st yellow ..... | 11 | 0 | 0 | 15 | 0 | 0 |
| ,, 2nd ,, ..... | 10 | 0 | 0 | 11 | 0 | 0 |
| ,, white ..... | 7 | 0 | 0 | 10 | 0 | 0 |
| Swedish ..... | 8 | 0 | 0 | 16 | 0 | 0 |
| White Sea ..... | 9 | 0 | 0 | 17 | 0 | 0 |
| Canada, Pine, 1st ..... | 16 | 0 | 0 | 26 | 0 | 0 |
| ,, ,, 2nd ..... | 11 | 0 | 0 | 17 | 10 | 0 |
| ,, ,, 3rd, &c. ..... | 8 | 0 | 0 | 10 | 10 | 0 |
| ,, Spruce, 1st ..... | 9 | 0 | 0 | 11 | 0 | 0 |
| ,, ,, 3rd and 2nd ..... | 7 | 0 | 0 | 9 | 0 | 0 |
| New Brunswick, &c. ..... | 6 | 10 | 0 | 8 | 10 | 0 |
| Battens, all kinds ..... | 8 | 0 | 0 | 16 | 0 | 0 |
| Flooring Boards, sq., 1 in., prepared, First ..... | 0 | 11 | 0 | 0 | 14 | 0 |
| Second ..... | 0 | 8 | 0 | 0 | 10 | 0 |
| Other qualities ..... | 0 | 5 | 0 | 0 | 7 | 0 |
| Cedar, Cuba.....foot | 0 | 0 | 4½ | 0 | 0 | 5 |
| Honduras, &c..... | 0 | 0 | 4½ | 0 | 0 | 0 |
| Mahogany, Cuba ..... | 0 | 0 | 4½ | 0 | 0 | 0 |
| St. Domingo, cargo average ..... | 0 | 0 | 4½ | 0 | 0 | 0 |
| Mexican ,, ..... | 0 | 0 | 4½ | 0 | 0 | 0 |
| Tobasco ,, ..... | 0 | 0 | 5½ | 0 | 0 | 0 |
| Honduras ,, ..... | 0 | 0 | 5½ | 0 | 0 | 0 |
| Box, Turkey .....ton | 4 | 0 | 0 | 13 | 0 | 0 |
| Rose, Rio..... | 15 | 0 | 0 | 20 | 0 | 0 |
| Bahia ..... | 14 | 0 | 0 | 18 | 0 | 0 |
| Satin, St. Domingo .....foot | 0 | 0 | 6 | 0 | 1 | 0 |
| Porto Rico ..... | 0 | 0 | 0 | 0 | 1 | 3 |
| Walnut, Italian ..... | 0 | 0 | 4½ | 0 | 0 | 0 |
| **METALS.** | | | | | | |
| Iron—Pig, in Scotland .....ton | 0 | 0 | 0 | 0 | 0 | 0 |
| Bar, Welsh, in London..... | 6 | 0 | 0 | 6 | 5 | 0 |
| ,, ,, at works in Wales ... | 5 | 10 | 0 | 6 | 0 | 0 |
| ,, Staffordshire, in London ... | 7 | 0 | 0 | 7 | 10 | 0 |
| Copper— | | | | | | |
| British, cake and ingot..... ton | 47 | 10 | 0 | 0 | 0 | 0 |
| Best selected ..... | 48 | 10 | 0 | 0 | 0 | 0 |
| Sheets, strong ..... | 56 | 0 | 0 | 0 | 0 | 0 |
| Chili, bars ..... | 43 | 0 | 0 | 0 | 0 | 0 |
| Yellow Metal.....lb. | 0 | 0 | 5 | 0 | 0 | 0 |
| Lead—Pig, Spanish .....ton | 12 | 11 | 3 | 0 | 0 | 0 |
| English, com. brands ..... | 12 | 12 | 6 | 0 | 0 | 0 |
| Sheet, English ..... | 14 | 0 | 0 | 0 | 0 | 0 |
| Tin—Straits ..... | 89 | 5 | 0 | 0 | 0 | 0 |
| Australian ..... | 90 | 10 | 0 | 0 | 0 | 0 |
| English Ingots..... | 94 | 0 | 0 | 0 | 0 | 0 |
| Bars ..... | 95 | 0 | 0 | 0 | 0 | 0 |
| Refined ..... | 96 | 0 | 0 | 0 | 0 | 0 |
| Zinc—English sheet .....ton | 24 | 0 | 0 | 24 | 10 | 0 |
| **OILS.** | | | | | | |
| Linseed .....ton | 21 | 12 | 6 | 21 | 17 | 6 |
| Cocoanut, Cochin ..... | 27 | 10 | 0 | 0 | 0 | 0 |
| Ceylon ..... | 24 | 0 | 0 | 24 | 10 | 0 |
| Palm, Lagos ..... | 26 | 0 | 0 | 0 | 0 | 0 |
| Rapeseed, English pale ..... | 31 | 10 | 0 | 0 | 0 | 0 |
| ,, brown ..... | 30 | 0 | 0 | 0 | 0 | 0 |
| Cottonseed, refined ..... | 25 | 10 | 0 | 27 | 0 | 0 |
| Tallow and Oleine ..... | 21 | 0 | 0 | 40 | 0 | 0 |
| Lubricating, U.S. ..... | 5 | 0 | 0 | 0 | 0 | 0 |
| ,, refined ..... | 7 | 0 | 0 | 12 | 0 | 0 |
| Tar—Stockholm .....barrel | 1 | 5 | 6 | 1 | 6 | 0 |
| Archangel ..... | 0 | 15 | 9 | 0 | 16 | 0 |

# CONTRACTS.

*Epitome of Advertisements in this Number.*

## CONTRACTS.

| Nature of Work, or Materials. | By whom Required. | Architect, Surveyor, or Engineer. | Tenders to be delivered. | Page. |
|---|---|---|---|---|
| Brick and Pipe Sewers, &c. | St. Mary Abbott's (Kensington) Vestry | *Official* | Oct. 8th | ii. |
| Broken Guernsey Granite | Willesden Local Board | O. Claude Robson | do. | ii. |
| New Sewers and Street Works | Mile End Vestry | J. M. Knight | Oct. 9th | xii. |
| Additional W.C.'s, &c., Homerton Infirmary | Hackney Union | W. Barnett | do. | xii. |
| Main Water-pipes, Hydrants, &c. | Chippenham R.S.A. | C. Doswell | Oct. 12th | xiii. |
| New Cemetery | Lymington Burial Bd. | J. Lemon | Oct. 14th | ii. |
| Small Cottage | Hornsey Local Board | T. de Courcy Meade | do. | xii. |
| Billiard Room, &c., Worthing | | A. Broad | do. | ii. |
| Fire Mains and Hydrants | Chelmsford Union | F. Chancellor | Oct. 15th | ii. |
| Broken Granite and Gravel | East Barnet Valley Local Board | G. W. Brumell | do. | ii. |
| Sewerage Works | East Ham Local Board | W. H. Savage | do. | xii. |
| Padded Rooms at Infirmary | Lambeth Guardians | T. W. Aldwinckle | Oct. 16th | xii. |
| Broken Granite | Enfield Local Board | *Official* | do. | xii. |
| York Paving Stone | Greenwich Bd. of Wks. | do. | do. | xii. |
| Branch Library | Battersea Public Libraries Commissioners | do. | Oct. 17th | ii. |
| Building Works | St. Mary (Islington) Guardians | Wm. Smith | do. | xii. |
| Bakehouse and Oven | do. | do. | do. | xii. |
| Purchase and Pulling-down Building Materials | School Bd. for London | *Official* | Oct. 21st | xii. |
| Main Drainage Extension | West Ham Council | Lewis Angell | Oct. 22nd | xii. |
| Railway Footbridges | Dover Town Council | *Official* | do. | xii. |
| Relief Line, Bristol | G. W. R. Co. | do. | do. | ii. |
| Foundations, &c., Admiralty Buildings | Com. of H.M. Works | do. | Oct. 23rd | xii. |
| Broken Granite | Gravesend U.S.A. | do. | Oct. 24th | xii. |
| New Offices | Gloucester Gaslight Co. | W. B. Wood | Nov. 5th | xiii. |
| Buildings at Chatham, Eastbourne, &c. | Salvation Army | J. W. Dunford | Not stated | xiii. |
| Four Brick-built Huts, &c., Shorncliffe | War Department | *Official* | do. | ii. |

## TENDERS.

[Communications for insertion under this heading must reach us *not later than* 12 *Noon on Thursdays*.]

BECKENHAM.—For the formation of new roads at South Beckenham—estimate A. for Mr. W. S. Forster, and estimate B, for Mr. Thos. Price. Messrs. Beeston & Burmester, architects and surveyors, 30, Lincoln's Inn-fields, W.C. Quantities by Mr. D. J. Brown, 61, Lincoln's Inn-fields, W.C. :—

| | Estimate A. | Estimate B. |
|---|---|---|
| Collingbach | £1,700 0 0 | £700 0 0 |
| Jones & Armitstead | 1,300 0 0 | 600 0 0 |
| Nowell & Robson | 1,249 0 0 | 592 0 0 |
| A. Marshall | 1,222 0 0 | 596 13 2 |
| W. & J. Woodham | 1,173 7 4 | 596 10 6 |
| Thos. Lanbury | 1,134 15 0 | 532 17 6 |
| R. Maxwell | 1,084 0 0 | 555 0 0 |
| Peill & Sons | 900 0 0 | 460 0 0 |
| Mid Kent Building Works* | 930 0 0 | 425 0 0 |
| Wm. Nicholls (received too late) | 1,203 0 0 | 563 0 0 |

* Accepted.

DOVERCOURT.—For building a house on the Lee-road for Mr. T. B Daniell. Mr. J. W. Start, architect, Cups-chamber, Colchester :—

| | |
|---|---|
| Grimwood & Son, Sudbury | £489 0 0 |
| Saunders & Son, Dedham | 390 0 0 |
| Mead & Willsher, Dovercourt | 376 0 0 |
| C. E. Orfeur, Colchester | 347 0 0 |
| F. Dupont (accepted) | 347 0 0 |

FENNY STRATFORD.—For the erection of new schools for the School Board for Fenny Stratford. Mr. W. Hull, architect, St. Giles's-street, Northampton :—

| | |
|---|---|
| Marriott, High Barnet | £4,246 0 0 |
| Rollaston, Eastbourne | 3,497 0 0 |
| Orchard & Son, Banbury | 3,496 0 0 |
| Yeril, Leighton Buzzard | 3,379 0 0 |
| Grist, Bierton | 3,376 0 0 |
| J. S. Kimberly, Banbury | 3,317 0 0 |
| Rickinbotham, Northampton | 3,300 0 0 |
| Heath, Towcester | 3,200 0 0 |
| Claridge & Bloxham, Banbury | 3,147 0 0 |
| J. T. Wingrove, Northampton | 3,143 0 0 |
| H. W. Welsh, Fenny Stratford | 3,075 0 0 |
| Ellwood & Son, Sandy | 2,994 0 0 |
| Willsett & Son, Cambridge | 2,987 0 0 |
| S. Hipwell, Wisbech | 2,979 0 0 |
| R. Finnigan, Northampton | 2,950 0 0 |
| H. Martin, Northampton | 2,850 0 0 |

GRAVESEND.—For the erection of new offices and paving cellars, at the Wellington Brewery, for Mrs. E. Walker. Mr. Arthur Kinder, architect, Laurence Pountney-hill, London, E.C. Quantities by Mr. Alexander H. Kinder, 34, Clements-lane, E.C. :—

| | |
|---|---|
| Multon & Wallis, Gravesend | £879 0 0 |
| J. Wallis & Sons, Maidstone | 867 0 0 |
| Rayfield, Northfleet | 845 0 0 |
| Gates, Frindsbury | 844 10 0 |
| Archer, Gravesend | 833 0 0 |
| E. & W. Wallis, Gravesend (accepted) | 825 0 0 |

LISKEARD (Cornwall).—For the erection and completion of Salvation Army "Fortress," for General Booth, in Liskeard. Mr. J. Williams Dunford, architect, 101, Queen Victoria-street, E.C. :—

| | |
|---|---|
| Read, Plymouth | £674 0 0 |
| Treherne, Liskeard | 636 0 0 |
| Lethbridge & Son, Plymouth | 619 0 0 |
| Rosskilly, Gunnislake | 607 7 7 |
| Madams, Liskeard | 549 0 0 |

LONDON.—For rebuilding premises in Cable-street, Shadwell, E., for Dr. F. E. Turner. Mr. H. Dow White, surveyor, 15, New Broad-street, E.C. :—

| | |
|---|---|
| Patman & Fotheringham | £3,173 0 0 |
| Grover & Son | 2,686 0 0 |
| Mayo | 2,449 0 0 |
| Spencer & Co. | 2,448 0 0 |
| Porter | 2,425 0 0 |
| Hood | 2,395 0 0 |
| Mallett (accepted) | 2,375 0 0 |
| Haywood | 2,184 0 0 |

LONDON.—For the erection of shop and offices in Bell-alley, London-wall, E.C., for Messrs. John Morgan & Sons. Mr. R. Bennett, architect, 1, Lawrence-lane, E.C. :—

| | |
|---|---|
| Drew & Cadman | £2,019 0 0 |
| G. Payne | 1,675 0 0 |
| Dove Bros. | 1,645 0 0 |
| J. Chappell | 1,597 0 0 |
| J. & J. Greenwood | 1,580 0 0 |
| Lascelles & Co. | 1,553 0 0 |
| Brass Bros. | 1,497 0 0 |
| Harris & Wardrop | 1,480 0 0 |
| Ashby Bros. | 1,472 0 0 |
| E. Lawrence & Sons | 1,472 0 0 |
| Patman & Fotheringham (accepted) | 1,439 0 0 |
| Scott | 1,327 0 0 |

LONDON.—For the erection and completion of Salvation Army "Citadel" buildings, for General Booth, in Wood-green. Mr. J. Williams Dunford, architect, 101, Queen Victoria-street, E.C. :—

| | |
|---|---|
| Simmonds, Reading | £1,552 0 0 |
| Brown & Swatland, New Southgate | 1,497 0 0 |
| Martin & Barclay, Battersea | 1,470 0 0 |
| Brown & Harris, Bloomsbury | 1,445 0 0 |
| Bardle, Glengall-road, S.E. | 1,428 0 0 |
| Whitehead & Co., Clapham-road | 1,395 0 0 |
| Coxhead, Leytonstone | 1,393 0 0 |
| Robson, Lewisham | 1,381 0 0 |
| Doubleday, Kingsland | 1,350 0 0 |
| Lobb & Oliver, New Southgate | 1,299 0 0 |
| Bacon, Croydon | 1,220 0 0 |
| Jarvis, Banbury | 1,150 0 0 |
| Ellwood & Son, Sandy (accepted) | 1,150 0 0 |

LONDON.—For new stables, &c., Sydenham, for Mr. Sydney Smith. Mr. A. H. Hennell, architect. Quantities by Mr. J. R. Vining :—

| | |
|---|---|
| Black & Son | £1,008 0 0 |
| Faulkner | 945 0 0 |
| Kilby & Gayford | 931 0 0 |
| S. Scott | 898 0 0 |
| Waddington & Co. | 795 0 0 |

LONDON.—For repairs, &c., to No. 2, Chitty-street, Charlotte-street, W.C., for Mr. Howlett. Mr. Walter J. Ebbetts, architect, Savoy House, 115, Strand, W.C. :—

| | |
|---|---|
| C. F. Kearley | £313 0 0 |
| W. D. Way | 223 0 0 |
| H. Baylis | 154 15 0 |

LONDON.—For the erection of workshop and general repairs to No. 80, Greenfield-street, E., for Mr. M. Cohen. Mr. John Hudson, architect, 80, Leman-street, E. :—

| | |
|---|---|
| Pritchard | £295 10 0 |
| Calnan & Co. | 278 0 0 |
| Coulsell Bros. | 247 0 0 |
| Gladding | 238 0 0 |

LONDON.—For alterations, &c., to Noriand Chapel, Uxbridge-road, in order to convert the same into a Salvation Army "Fortress." Mr. J. Williams Dunford, architect, 101, Queen Victoria-street, E.C. :—

| | |
|---|---|
| Mannering, Adam-street, W.C. | £844 10 0 |
| Doubleday, Kingsland | 740 10 0 |
| Coxhead, Leytonstone | 700 10 0 |
| Martin & Barclay, Battersea* | 450 0 0 |

* Accepted.

LONDON.—For alterations and additions to shops at Clapham Junction, for Messrs. Arding & Hobbs. Messrs. Tolley & Son, Architects :—

| | |
|---|---|
| C. Jewell | £376 10 0 |
| Waddington & Co., Limited | 365 0 0 |
| Capel | 308 13 6 |
| Marriage (accepted) | 295 0 0 |

LONDON.—For new shops and premises at 300 and 302, Holloway-road, for Messrs. Sheffield & Powell. Mr. R. Bennett, architect, 1, Lawrence-lane, E.C. :—

| | |
|---|---|
| G. Parker | £1,750 0 0 |

LONDON.—For new shop and premises at 87, Newington-causeway, for Mr. William Shotter. Mr. R. Bennett architect, 1, Lawrence-lane, E.C. :—

| | |
|---|---|
| Messrs. F. Sage & Co. | £913 0 0 |

LONDON.—For taking down and rebuilding three warehouses in Beech-street, Barbican, for Mr. C. E. Ingram. Messrs. Beeston & Burmester, architects, 30, Lincoln's Inn-fields, W.C. Quantities by Mr. D. J. Brown, 61, Lincoln's Inn-fields, W.C. :—

| | |
|---|---|
| H. Dye | £7,289 0 0 |
| T. L. Green | 5,499 0 0 |
| Colls & Son | 5,380 0 0 |
| Patman & Fotheringham | 5,350 0 0 |
| Mark Gentry | 5,323 0 0 |
| Turtle & Appleton | 5,184 0 0 |
| Simpson & Son | 5,100 0 0 |
| Brass & Son | 5,073 0 0 |
| J. Anley (accepted) | 5,066 0 0 |

LONDON.—For pulling down and rebuilding the "Eagle" tavern, Farringdon-road, W.C., for Mr. J. Saddington. Messrs. Wylson & Long, architects, 15, King William-street, Strand. Quantities by Messrs. Argent & Woodward, 7, Duke-street, Adelphi :—

| | |
|---|---|
| Patman & Fotheringham | £3,648 0 0 |
| Oldrey | 3,578 0 0 |
| Leslie & Co. | 3,562 0 0 |
| T. L. Green | 3,547 0 0 |
| J. T. Chappell | 3,399 0 0 |
| C. F. Kearley (accepted) | 3,245 0 0 |

LONDON.—For alterations and additions to the "Manor House" public-house, Westbourne-terrace North, W., for Mr. C. Brisley. Mr. T. H. Smith, architect, 17 and 18, Basinghall-street, E.C. :—

| | |
|---|---|
| F. G. Jelly | £1,641 0 0 |
| R. Perkins | 1,376 0 0 |
| A. E. Nightingale | 1,268 0 0 |
| Spencer & Co | 1,180 0 0 |
| Turtle & Appleton | 1,139 0 0 |
| C. F. Kearley (accepted) | 998 0 0 |
| *Gasfittings.* | |
| W. Heath | 123 10 0 |
| W. Winn | 120 3 3 |
| Vaughan & Brown | 116 4 0 |
| J. Biggs | 97 15 4½ |
| Buckley & Beach | 95 7 6 |

LONDON.—For alterations at the "Pitts Head" public-house, Goswell-road, E.C., for Mr. J. Jeney. Mr. Joseph G. Needham, architect, 11, Powerscroft-road, Lower Clapton :—

| | |
|---|---|
| S. W. Hawkings | £114 0 0 |
| A. & F. Wilson | 110 0 0 |
| W. J. Kellaway | 107 0 0 |
| Burgess & Algar (accepted) | 97 10 0 |
| *Gasfittings.* | |
| Ungar & Co. | 30 0 0 |

LONDON.—For alterations to the "Marquis of Granby" public-house, 51 and 52, Chandos street. Mr. W. Seckham Witherington, architect, 79, Mark-lane, E.C. :

| | |
|---|---|
| Kuffer & Co. | £997 0 0 |
| Tory | 838 0 0 |
| Coulthard | 780 0 0 |
| Patman & Fotheringham | 778 0 0 |

LONDON.—For alterations and additions to No. 17, Pennant-mews, Cromwell-road, S.W., for Mr. R. Smith. Messrs. Beeston & Burmester, architects, 30, Lincoln's Inn-fields, W.C. :—

| | |
|---|---|
| Kinnimont & Sons | £550 0 0 |
| T. L. Green | 485 0 0 |
| Macfarlane Bros. (accepted) | 420 0 0 |

LONDON.—For alterations and fittings to No. 4, Billiter-street, E.C., for Messrs. Partridge & Co. Messrs. Beeston & Burmester, architects, 30, Lincoln's Inn-fields, W.C. :—

| | |
|---|---|
| T. L. Green | £440 0 0 |
| C. Horton (accepted) | 349 0 0 |

LONDON.—For repairs to No. 3, Argyle-road, Ealing, for Miss Hird. Messrs. Beeston & Burmester, architects, 30, Lincoln's Inn-fields, W.C. :—

| | |
|---|---|
| C. Horton | £126 16 0 |
| T. Nye (accepted) | 106 0 0 |

LONDON.—For alterations to 4, Ennismore-gardens, Kensington, exclusive of decorations, for Lord Halsbury. Mr. Charles Bell, architect, 3, Salters' Hall-court, Cannon-street, E.C. :—

| | |
|---|---|
| Chas. Wall, Chelsea (no other tender) | £375 0 0 |

LONDON.—For alterations, &c., at the "Sols Arms," Hampstead-road, for Mr. McCarthy. Messrs. Furniss & Thorpe, architects, Kentish-town :—

| | |
|---|---|
| Anley | £2,289 0 0 |
| Scrivener | 2,263 0 0 |
| Tomes | 2,194 0 0 |
| Gould & Brand | 2,174 0 0 |
| Voller (accepted) | 2,159 0 0 |

LONDON.—For building two warehouses in Worship-street. Mr. C. Bell, architect :—

| | |
|---|---|
| Anley | £3,900 0 0 |

[No competition.]

LONDON.—For building warehouse in the City-road. Mr. C. Bell, architect :—

| | |
|---|---|
| Anley | £1,050 0 0 |

LONDON.—For rebuilding the "Golden Eagle" public-house, Marylebone-lane. Messrs. Furness & Thorpe, architects :—

| | |
|---|---|
| Armitage & Hodgen | £1,549 0 0 |
| Patman & Fotherington | 1,451 0 0 |
| Voller | 1,248 0 0 |
| Scrivener & Co. | 1,239 0 0 |
| Tomes | 1,211 0 0 |
| Anley | 1,180 0 0 |

LONDON.—For rebuilding the "Brewery Tap," Wenlock-road, City-road :—

| | |
|---|---|
| Downs | £968 0 0 |
| Bellington | 846 0 0 |
| Anley | 794 0 0 |

LONDON.—For additions and alterations at the "Queen's Head" tavern, Theobald's-road. Messrs. Alexander & Gibson, architects, 40, Great James-street :—

| | |
|---|---|
| Beal | £1,890 0 0 |
| Mattock Bros. | 1,880 0 0 |
| Anley | 1,840 0 0 |

LONDON.—For new Vestry Hall and Offices for the Parish of St. Martin-in-the-Fields, at St. Martin's-place. Mr. Robert Walker, architect, 33, King-street, W.C. Quantities by Messrs. Woodward & Pollard:—

| | | | |
|---|---|---|---|
| R. Horkley & Son | £28,200 | 0 | 0 |
| S. & W. Pattinson | 27,971 | 0 | 0 |
| T. L. Green | 27,623 | 0 | 0 |
| Brass & Son | 27,583 | 0 | 0 |
| G. Stephenson | 27,292 | 0 | 0 |
| T. Elkington | 27,250 | 0 | 0 |
| Garlick & Horton | 26,990 | 0 | 0 |
| Kirk & Randall | 26,729 | 0 | 0 |
| Allen & Sons | 25,619 | 0 | 0 |
| Stephens & Bastow | 25,575 | 0 | 0 |
| B. E. Nightingale | 25,560 | 0 | 0 |
| Lawrence & Son | 25,513 | 0 | 0 |
| E. Toms | 25,436 | 0 | 0 |
| J. T. Chapsell | 25,390 | 0 | 0 |
| D. Charteris | 25,242 | 0 | 0 |
| Peto Bros. | 25,187 | 0 | 0 |
| Lobb & Oliver | 23,536 | 0 | 0 |
| Mowlem & Co. | 23,206 | 0 | 0 |

NORBITON.—For roads and sewers, &c., on the Norbiton Estate:—

| | | | |
|---|---|---|---|
| Richard Mayo, Limited, Brixton-road, S.W. | £1,160 | 0 | 0 |
| Alfred Bone, Battersea-park-road | 1,126 | 0 | 0 |
| C. Oldridge & Sons, Norbiton | 1,100 | 0 | 0 |
| G. Neal & Co. (Limited), Wandsworth (accepted) | 1,029 | 0 | 0 |

PORTSMOUTH.—For additions to the "Derby" Tavern, Stamshaw, Portsmouth, for Mr. William Gibb. Messrs. Rake & Cogswell, architects, Portsea:—

| | | | |
|---|---|---|---|
| D. W. Lewis | £660 | 0 | 0 |
| J. H. Corke | 620 | 0 | 0 |
| Harding & Burnett | 612 | 10 | 0 |
| Jas. Crockerell | 565 | 0 | 0 |
| T. P. Hall | 550 | 0 | 0 |
| F. White | 550 | 0 | 0 |
| George Beech | 482 | 6 | 4 |
| Scammell & Dowdell (accepted) | 450 | 0 | 0 |

SAFFRON WALDEN.—For altering and re-seating in pitch-pine the Congregational Chapel, Abbey-lane. Mr. Frederic H. Johnson, Saffron Walden, architect:—

| | | | |
|---|---|---|---|
| G. Whiffin & Son | £1,037 | 0 | 0 |
| B. Dix | 999 | 0 | 0 |
| Wm. Bell & Sons | 967 | 0 | 0 |
| *For Painting, Plumbing, &c.* | | | |
| A. Rogers | £371 | 13 | 0 |

SHEFFIELD.—For alterations and additions to the Methodist New Connexion Chapel, South-street, Sheffield. Mr. A. H. Goodall, architect, Market-street, Nottingham. Quantities by the architect:—

| | | | |
|---|---|---|---|
| George Longden & Son, Sheffield | £2,019 | 0 | 0 |
| Thos. Astling, Sheffield | 1,[illegible] | 13 | 0 |
| John Cooper, Nottingham | 1,[illegible] | 0 | 0 |
| John Chambers & Son, Sheffield | 1,[illegible] | 0 | 0 |
| E. & W. Oxley, Sheffield | 1,[illegible] | 0 | 0 |
| W. Crooks & Son, Sheffield | 1,805 | 0 | 0 |
| A. Smith, Sheffield | 1,769 | 0 | 0 |
| Wheat, Sheffield | 1,710 | 0 | 0 |
| Dutton & Evans, Sheffield | 1,677 | 0 | 0 |
| Thos. Cuthber, Nottingham* | 1,630 | 0 | 0 |

* Accepted.

SOUTHSEA.—For the erection and completion of Salvation Army "Fort" at Southsea. Mr. J. Williams Dunford, architect, 101, Queen Victoria-street, E.C.:—

| | | | |
|---|---|---|---|
| Polton, Portsmouth | £328 | 5 | 0 |
| Cockerell, Landport | 324 | 0 | 0 |
| Elsey, Portsea | 320 | 0 | 0 |
| Biggs, Southsea | 318 | 0 | 0 |
| Hall, Southsea | 302 | 0 | 0 |
| Pittis, Southsea | 285 | 0 | 0 |
| Learmouth, Portsmouth (accepted) | 270 | 0 | 0 |

SYDENHAM.—For fitting up bar at the "Fox and Hounds" public-house, High street, Sydenham, for Mr. R. W. White. Mr. T. H. Smith, architect, 17 and 18, Basinghall-street, E.C.:—

| | | | |
|---|---|---|---|
| J. & W. Taylor | £373 | 0 | 0 |
| S. Williamson | 308 | 0 | 0 |
| Sanders & Son | 289 | 0 | 0 |
| Buckley & Beach (accepted) | 250 | 0 | 0 |
| *Gasfittings, &c.* | | | |
| McPherson, jun. | 113 | 7 | 0 |
| J. Biggs | 107 | 3 | 6 |
| W. Winn | 102 | 0 | 0 |
| Buckley & Beach | 93 | 0 | 0 |
| W. Heath | 92 | 0 | 0 |
| Vaughan & Brown (accepted) | 89 | 15 | 0 |

VANGE (Essex).—For the erection of a cottage, and repairs to farm-buildings at Goulding's Farm, Vange, Essex, for the Trustees of Mashiter's Trust. Mr. John Hudson, architect, 80, Leman-street, E.:—

| | | | |
|---|---|---|---|
| W. Gladding (accepted) | £290 | 0 | 0 |

WALTHAM CROSS.—For the erection of a house and shop at Waltham Cross, on the Colvin Estate. Mr. John Hudson, architect, 80, Leman-street, E.:—

| | | | |
|---|---|---|---|
| J. Bentley (accepted) | £360 | 0 | 0 |

WINGHAM (Kent).—For the erection and completion of Salvation Army "Fort," for General Booth, in Wingham, Kent. Mr. J. Williams Dunford, architect, 101, Queen Victoria-street, E.C.

| | | | |
|---|---|---|---|
| Sargent & Son, Canterbury | £285 | 0 | 0 |
| Lovell, Wingham | 227 | 15 | 0 |
| Fetherstone, Littlebourne | 215 | 0 | 0 |

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## TO CORRESPONDENTS.

C. A. (thanks: but of no use to us).—E. W. (we cannot continue the correspondence; we have inserted a correction of a statement that was unwarrantable, and backed the correction with our own expression of opinion: and that must suffice).—F. J. B. (ditto).—H. M. (impossible to find space).—C. C. (question too vague; name the particular pavement you refer to).—J. N. & Co.—A. O. H. (we prefer to notice works of that kind after they are complete, not when they are in contemplation).—H. B. & Co. (sent too late).

All statements of facts, lists of tenders, &c. must be accompanied by the name and address of the sender, not necessarily for publication.

We are compelled to decline pointing out books and giving addresses.

NOTE.—The responsibility of signed articles, and papers read at public meetings, rests, of course, with the authors.

*We cannot undertake to return rejected communications.*

Letters or communications (beyond mere news-items) which have been duplicated for other journals, are NOT DESIRED.

All communications regarding literary and artistic matters should be addressed to THE EDITOR; all communications relating to advertisements and other exclusively business matters should be addressed to THE PUBLISHER, and *not* to the Editor.

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Walnut Dadoes „ 1s. 11d. „
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